Annotated Bibliography

Tax and Economic Incentives toward the issue of: Making good Silviculture Pay

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Maine Forest Service
Forest Policy and Management Division

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Note to Reader

This Annotated Bibliography is a collection of sources that demonstrate or propose government policies promoting good, sustained forest management; some of the policies are applicable at the local level, some at the state, and some at the federal level. A wide variety of literature is summarized, and though this work is not a complete bibliography citing all of the literature available, it was attempted to prevent duplication and repetition of programs and policies. For example, there were numerous articles and reports that discussed the Norwegian Forest Trust Fund, but two works are cited in this annotated bibliography in order to maximize the efficiency for both the researcher, and the reader; likewise there are available countless works on different current use property tax programs, but it would be redundant to cite all of them here. Lastly, though the literature cited is summarized, some works very thoroughly, this is not a substitute for the actual body of literature itself. This publication is merely a tool to aid researchers and policy-makers in their search for policies, and the literature covering those policies.

Key to Sources

**** Highly detailed and descriptive
*** Fairly detailed and descriptive
** Some details and description
* Not very detailed or descriptive

A. Property Taxes
B. Estate Taxes
C. Harvest and Yield Taxes
D. Other Tax Incentives
E. International Strategies
F. Technical Assistance Programs
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ABDG * Best, Constance and Laurie A. Wayburn. 2001. Part 2: The Conservation Toolbox and How to Use It. P. 117-206 in *America's Private Forests: Status and Stewardship*. Island Press, Washington, DC.

This book covers only briefly different plans and programs to promote sustainable forestry, but points out examples of policies and programs either already in place elsewhere or that have been proposed by other authors. For example, when talking about Forest Stewardship Programs, Best states that Pennsylvania, Montana and Washington states have exceptional programs. These programs allow landowner interaction in the creation of a management plan with foresters, instead of simply having a forester come in and create a plan for the landowner, this gets the landowner involved in the process, providing more motivation to carry through with the program, because of personal involvement. These states provide a ten-session workshop series on forest ecosystem management that includes field trips and homework, and the workshop series ends with the creation of the landowner's stewardship plan. In some states there also exists Master Woodland Manager Programs. These programs are very similar to the Forest Stewardship Programs in Montana, Pennsylvania and Washington, except the MWMP uses an 85 hour workshop, which is free, however participants are required to tutor other landowners on the information provided at the workshop. Participants spend time in their own forest land and at the end of the workshop present their forest management plan, then after the workshop, the participants tutor their peers, and the eventual effect is an exponential growth in the number of informed landowners involved with sustained forest management. There are several policies and programs that are already in place, or being proposed, which amplify and assist the benefits of conservation and good forestry; these policies and programs include:

- *Allowing landowners to more fully realize the income tax benefits of CE gifts*. The amount deductible from income taxes should be raised to 50% from 30%.
- *Create tax credits for conservation and stewardship*. Several states have tax credit programs that give recipients more cash value for CE donations. Tax credit is allowed for some percentage of the value of the CE and can be taken in addition to the charitable tax deduction. Credit for the out of pocket expenses for creating CEs should also be implemented.
- *Put conservation sales of property and conservation easements on a more competitive footing with sales for development.* In 1999 a proposal was made to Congress to exclude 50% of the income from the conservation sale to land trusts or government agencies from capital gain taxation.
- *Expand existing estate tax benefits*. Land under CEs is exempt from estate taxes if it is located in certain geographical areas, i.e. near developing areas. This incentive should be expanded to include all areas, and the cap on the value of exemption should be removed.

- *Reduce negative impact of estate taxes*. The estate tax exemption level should be raised to $5 million, so that only the wealthiest ownerships are required to fund the estate tax; these ownerships are the best equipped to create a high-quality estate tax plan, and can more easily absorb the estate tax burden.
- *Reduce impact of capital gains taxes on long-term forest investments*. Capital gains taxes do not support long timber rotations, because of inflation; therefore, the timber basis should be indexed to inflation after twenty years, so it becomes more profitable to manage forests for long term gains.
- *Provide tax deductibility of forest stewardship expenses*. Many forest stewardship expenses are not considered normal business expenses, changing this, and allowing the expenses to be tax deductible would motivate forest landowners to use sustainable management practices.
- *Improve property tax treatment for forestland*. The ad valorem property tax should be eliminated and replaced with a tax system that gives breaks and benefits to land that is under long term management.

AC ** Cook, Philip S., and Jay O'Laughlin. 2001. Taxing Forest Property: Analysis of Alternative Methods and Impacts in Idaho. University of Idaho: Moscow, ID.

This report discusses the two property taxation methods: the productivity tax and the bare land and yield tax, which are covered in the Forest Land Taxation Law annotation under Idaho State Tax Commission, however, there is more details covering how the valuations are made, and also different property tax methods used by other states are summarized and discussed. First, the forest productivity value for taxing timberlands, or current use value is determined by the following equation: [(MAI x SV) + A - C] / R.

- MAI = Mean Annual Increment of timber grown (board feet/acre/year)
- SV = Stumpage Value (4/thousand board feet); preceding five year rolling average of timber harvested within the forest value zone from state timber sales or the best available data for the same five year period.
- A = Agricultural and other related income ($/acre) for example grazing income from woodlands
- C = Costs ($/acre) annualized expenses related to producing the forest crop, including maintenance, improvement, and management of the timber over the rotation period, also including fees charged by the Idaho Department of Lands
- R = Rate of capitalization. The basis for the capitalization rate is the interest rate for the Farm Credit Services bank district serving Idaho; 0.85% is added to his, as well as a component for

the local tax rate, which is based on the average county levy rate for forest land statewide. At the time of publication, the capitalization rate was about 10%, the lowest level since 1984. The bare land and yield tax program has proven throughout its history to be more stable, with the taxable value of land rising much less dramatically under this option than under the productivity option, as is shown by the graph, included in the appendices. The bare land tax values vary for each of the four zones in Idaho and also vary by productive class, the values were initially established by the Idaho State Tax Commission in 1982, and change at one-half the rate that stumpage value changes; so if stumpage values rise 10% in a year, the taxable value of the bare land would rise 5%. However, stumpage values are a rolling average of stumpage values, including the variety of prices for timber during the current year, and the previous five years, this option ensures that the taxes levied on bare land, or the yield tax will rise drastically from one year to the next, even if stumpage values change dramatically.

After discussing the productivity tax and the bare land and yield taxes, different methods of property taxation in place around the nation are covered, including: ad valorem taxes, forest productivity taxes, site value taxes, flat property taxes, and yield and severance taxes. No specifics are covered, simply the general overview of what these different tax methods are and how they generally work, this information is included in several other annotations and will be skipped here. A chart of the different tax policies in place in all fifty states is included in the report, and here in the appendices.

ABD *** DeCoster, Lester A. 1995. Maintaining the Public Benefits of Private forests Through Targeted Tax Options. Forest Policy Center, Washington, DC.

This report discusses the negative impacts that most tax laws have on the sustainable forestry, many laws that were in fact enacted to protect the forests end up hurting them. For example, the estate tax sometimes requires up to 60% of inherited wealth, when this wealth is inherited in the form of forest land, sometimes the only way for the owner to generate the money to pay the taxes is to clear cut, sell the land, or otherwise adversely affect the potential of the land as forest land. Also inflation severely affects the return rate from forests held for long term profitability; timber forests are much more profitable if bought, harvested immediately and then sold again, while forest length rotations hurt landowners with inflation. Propositions in the report include changes to the estate tax laws policies; which do not support the sustainability of a forest for the length of forest rotations.

- Heirs of forest land should have the right to: “keep land at current-use (special-use) values by making post mortem forest use commitments” through conservation easements.

- Forest lands committed to remain in their current use for 25 years should qualify for special use valuation.
- Values that can be passed on should be raised and indexed to reflect the rising value of land.
- Forest owners should be able to pass land (to be kept in its current use for 25 years) to persons outside the family.
- The recapture tax should be eliminated when timber is sold within 25 year current use periods, or conservation easements are donated.
- Taxes on long-term gains should be lowered or adjusted for inflation.
- Gains from the sale of conservation easements should be excluded from taxable income.
- Incentive programs' payments to landowners should also be excluded from taxable income.

The report also proposes the establishment of Green IRAs, or GIRAs. This would be pre-tax money invested into accounts that can be later used for forest management; an example is given of the benefits of GIRAs for a parcel of land which produces $5.00 of income. With a 28% tax rate the owner would pay $1.40 in taxes and keep $3.60. If, the owner could put 20% of gross income into a GIRA, then $1.00 would be put into a GIRA and $1.12 (28% of $4.00) would be paid in taxes and the owner would retain $2.88. The money in the GIRA would be used for forest management and increase the yield of the parcel, and so the next gross income would be $8.00, 20%, or $1.60 would be put into the GIRA, $1.79 (28% of $6.40) would be the tax, and the owner would keep $4.61Simplification of the tax laws and rules is also necessary; many landowners forgo a great deal of their tax benefits simply because of confusion, or from thinking that the complexity of the system is not with the rewards. Finally, the report recommends a complete overhaul of the forest taxation system by creating a special section regarding forests; because all of the current laws are piled together in many layers and grouped with other activities that in no way relate to forestry.

BG ** Defenders of Wildlife. 1998. Section 2: Conservation Incentives. P. 13-27 in *National Stewardship Incentives: Conservation Strategies for U.S. Landowners*. Defenders of Wildlife, Washington, DC.

This is a publication by the Defenders of Wildlife Organization that provides a basis and foundation for researching the issue of making good silviculture pay. Market-based incentives are proposed as a main option in promoting conservation, in particular green marketing, which helps the environment, while raising the prices of items produced under environmentally friendly conditions; producing positive results for both the environment, and the industrial private owner. Environmentally savvy customers prefer to purchase green products despite the slight raise in prices. Many government regulations today in some cases act to discourage proper forest management, and

encourage poor silviculture, certain criteria for incentive programs are put forth so that the programs act the way they are intended to. These criteria include:

- ensuring the reward is large enough to convince landowners to participate
- removing administrative obstacles, streamlining regulations and providing all the information: a "no-surprises" policy
- must meet broad conservation needs
- must be cost-effective
- must be easy to understand
- must be acceptable to landowners
- should be flexible

Different tools for promoting good forestry are then proposed; these include state and regional stewardship councils, stewardship certification, and education on conservation planning. Tax reform is also proposed; estate taxes are the main problem, which in reality promote fragmentation of land. Another proposed alternative policy named is regulatory relief; this is an "alternative compliance" tool that allows landowners who practice good stewardship to bypass much of the red tape involved with lumber harvesting. This helps ensure that large landowners who are already practicing good management receive benefits for their actions. In appendix A, a table containing all the incentive options, their requirements, advantages and disadvantages is included.

ABCDFG ** Ellefson, Paul V. 1992. *Forest Resources Policy: Process, Participants, and Programs*. McGraw-Hill, Inc., New York, NY.

This book covers forest policy programs that are available to federal and local governments, including technical assistance programs, cost share programs as well as tax incentives. The technical assistance programs include management plans made by state foresters, education on the newest developments and innovations in the field of forestry and so on. The cost share programs include the federal Forestry Incentives Program and the Stewardship Incentives Program which cover part of the payment for forestry activities. When considering tax programs, Ellefson says that all tax policies should be:

- Neutral in effect: tax policies should not interfere too much with the optimum allocation and use of resources, i.e. a tax policy should not encourage forest exploitation.
- Equitable in application: distribution of the tax load among citizens and producing organizations should help in attainment of a desired pattern of income distribution. Similar pieces of forestland should be treated similarly.
- Efficient to collect and administer: real costs of collecting a tax should be as small as possible, and convenient to taxpayers, i.e. a tax program

should not oblige the taxpayer to keep detailed and complicated records for long periods of time.

- Certain as to amount: tax rates should be dependable over time.

Income taxes are a problem with the forestry industry because they do not support long term forestry since the elimination of favorable treatment income from long term capital gains. Estate and inheritance taxes discourage long term sustained management of forests as well because of the lack of provisions for forestland, which usually adds up to a great deal of market value, but not much profit at the time when the taxes are levied. Ellefson covers property taxes, their problems and solutions to those problems in detail. First, the problems with ad valorem property taxes are:

- Convenience: property taxes are not convenient because they make annual collections from property that does not usually provide annual income.
- Equity: these taxes are not equitable because an excessively large share of revenue is taken from forest properties that produce deferred income.
- Neutrality: they are not neutral, in fact property taxes encourage shorter rotations, lower stocking levels, and shifts from forestland into other uses.
- Predictability: it is never certain how much the taxes will amount to; this discourages long term investment in timberlands.
- Efficiency: the government chooses to annually appraise the value of forests, which breaks the aforementioned efficiency rule; furthermore, forestland is very difficult to assess because of the many variables contributing to the value.
- Ad valorem taxes do not bear any relationship to the current income producing potential, forcing owners to transform forest land into more immediate income producing uses.

Solutions to these faults that have been implemented or proposed at the state or local government level are then listed and summarized.

- Exemption laws: Forestland or timber can be excluded from property taxes, either permanently or for a specific period of time.
- Rebate laws: landowners who engage in approved forestry activity such as tree planting may apply for a refund of part of the taxes on the value of the timber, land or both. Usually rebates continue for a limited period of time and are given either as reductions in taxes or as cash payments.
- Deferred-payment laws: annual taxes on forest property and timber are assessed as for other classes of property, but some portion of the tax is deferred until the timber harvest.
- Modified rate laws: forest property and timber are assessed like other properties, but a lower tax rate is applied to the forest property and timber.
- Modified assessment laws: Forestland is valued differently from other forms of taxable property. Forest valuations are frozen or calculated using a reduced assessment ratio.

- Productivity tax laws: a calculated productivity value which varies with the quality of the forestland is applied. The tax is figured on per/acre value, which varies with different levels of timberland productivity.
- Yield tax laws: Forestland and timber values are separated. The land values continue to be subject to a form of property tax, levied annually; but timber values are untaxed until the harvest. When timber is harvested usually it is taxed at a percentage of its estimated stumpage value.
- Severance tax laws: A tax is levied on owners who harvest timber. These taxes are imposed in addition to traditional ad valorem taxes. Severance taxes differ from yield taxes in that they re calculated as a fixed amount per unit of product.

ABCE *** Grayson, A.J. 1993. *Private Forestry Policy in Western Europe*. CAB International, Wallingford, UK.

This book covers forestry policy of ten countries in Western Europe, and then briefly other countries in Eastern Europe, and around the world.

- Britain: the United Kingdom does not require commercial woodlands owners to pay an income or corporation tax, though this may have changed since publication. When determining the value of an estate for inheritance tax purposes, timber is not included in the value, only the land being transferred; taxes are later borne if the timber is cut after the transferal. Woodland owners are also exempt from capital gains taxes.
- Ireland: There is no land tax for private forestry in Ireland, the only tax burden comes from capital acquisitions taxes. This is an inheritance or gift tax; timberland is valued at full market value, but relief is offered for timberland. When the beneficiary is defined as a farmer, the tax the market value less IR£200,000 or 50%, whichever of the two is lesser; when the beneficiary is not a defined farmer, 50% of the timber value is exempt, but not the land.
- France: French policy does not seem to be designed specifically for good forest management, though there are some elements in the taxation system that encourages good forest management. The income tax system, which is based on expected income rather than actual income, and therefore includes forestlands as an annual source of income, exempts from payments completely young forest stands for 10 years on poplar stands, 20 years for conifers, and 30 years for broadleaf species other than poplar. Additional relief is given from the burden of property taxes for young stands, which usually adds up to a one third deduction from property taxes. France's inheritance tax is very interesting though, it is considered inappropriate to levy a tax on the trees, so the inheritance tax is levied on the soil; the soil is valued at

25% of the value of the land, and so whatever the normal inheritance or gift tax would be, it is reduced by 75% for forestland. Also, if the owner creates a management plan and pledges to keep to the management plan, the inheritance tax payment may be deferred for 30 years; but also, if an heir owns a forest for 30 years before the owner's death, the inheritance tax is actually eliminated. Thus promoting long-term sustained management of forests.

- Belgium: There is no property tax in Belgium, and there are no income tax policies related to forestry. However, the gift or inheritance tax was expected to follow the same policy as in France, reducing the burden by 75%. At the time of publication, land in Belgium passing to a child was based on the capital value of 250,000 B. fr. per hectare, on which the taxes were 10%, or 25,000 B. fr. per hectare. In Belgium it is possible to pay via annual installments, reducing the immediate tax burden by one third. After the adoption of the relief policy, the tax would be 6,250 B. fr. per hectare; the two conditions of the 75% relief on the inheritance tax would be the creation of a simple forest management plan, and that the owner maintains the area as forest for 30 years.
- The Netherlands: There is no income tax due from woodlands, there is a water board tax which every landowner, forestland or otherwise must pay in the Netherlands. As for property taxes, forests are completely exempt from paying property taxes. There is a wealth tax in the Netherlands, which is a flat rate of 0.8% on assets over gld. 250,000, but forestland is given reductions from this if it has satisfied the terms of the Landscape Act, which is an act adopted to make forestland more available to the public and the growing demand for recreation in forests. Reductions from the wealth tax on forestland are 50% if simply by adhering to the Landscape Act and complete exemption from the tax if the land is open to the public. The same reduction and exemption apply to regarding the inheritance tax, but only if the land is managed by the terms of the Landscape Act for 25 years.
- Germany: All taxes of forestland are based on the "standard value" which is specific to each individual region, and based on the appropriate level of yield for specific region's soil quality and ability to grow timber. Other than this specific institution there are no provisions in the tax policies that promote good forest management.
- Denmark: In Denmark, there are no provisions for landowners with regards to property tax or income tax, however, wealth tax policies allow deductions for forestland. The wealth tax rate is 1.5% on net assets over 1.3 million D. kr.; however for businesses, including forestry, 80% is relieved from the obligation, and further relief is allowed at 60% so in effect, the wealth tax for forestland is only 0.12% on net assets over 1.3 million D. kr. There is no relief for forestland on inheritance taxes.

- Sweden: In Sweden, there are no property taxes on forest land or forestry buildings. For the wealth tax, forest property values are reduced by 70% of which usually 3% is required in wealth taxes. There are no provisions for forestry in capital gains tax policy, there are however for inheritance tax policy; like with the wealth tax, the value of the forestland is reduced by 70% before taxes are taken.

AG ** Harlan, Julie. 1999. Environmental Policies in the New Millennium: Incentive-based Approaches to Environmental Management and Ecosystem Stewardship. Conference Summary. World Resources Institute, Washington, DC.

This is a summary of a conference held with one hundred members of the business community, NGOs, federal and state regulators, and other interested parties, brought together to discuss incentives-based policies for better environmental management. The report is very general and broad, but provides a set of guidelines to assist policy makers in designing programs and policies for environmental management. Among the guidelines are:

- establish clear goals, indicators, and end points
- incentives and language must be targeted to stakeholders' needs
- establish strong consistent leadership
- experiment with demonstration projects
- create equal-opportunity incentive programs
- design programs to appropriate scales
- programs must be flexible, practical, and adaptable
- establish credibility and comparability of information
- establish clear guidelines with how far states can go with efforts to innovate
- develop metrics to help industry and consumers assess costs and benefits of production or behavioral changes
- recognize and address fears about incentive-based programs
- establish externally imposed deadlines for change
- consider using combinations of trading and tax incentives
- consider moving beyond industry reporting toward self-auditing, with required disclosure

The report continues on to discuss challenges in society that act as a barrier to more widespread use of incentive-based policies. The list of these barriers includes things like the poor valuation of natural resources on the marketplace, strict divisions among government agencies, and the lack of proper education about sustained environmental management at all levels. Several incentive programs exist, in the form of tax incentives and others that promote good environmental management. Two counties in Washington state have a program called the Public Benefit Rating System;

under this system landowners receive points by doing sustained management activities to the land, including watershed preservation, salmon and wildlife habitat, stream buffers. The points add up and are translated into deductions from property taxes, the more environmentally sound activities the landowner participates in, the more money is saved on property taxes.

DG ** Harrison, S.R. and J.L. Herbohn. 2001. Chapter 14: Taxation in the Forestry Setting. P. 179-195 in *Sustainable Farm Forestry in the Tropics*. Edward Elgar Publishing Inc. Northampton, MA.

This book covers taxation policies for forestry in Australia; although the primary practice of timber harvesting in Australia seems to be clear cutting of a plot, then replanting. Reforestation expenses that are deductible in Australian tax laws are: preparation of site for planting, cost of seedlings, cost of planting, fertilizer, weed management, pruning, and thinning. There are also two classes of timberland owners: primary producers and non-primary producers. Primary producers are landowners who are involved in the timberland as a sustained, long-term business for profitability, not simply buying land, harvesting and selling the timber, then selling the land for one-time profit. Australian laws take many things into account when determining whether a landowner is a primary producer or not, including: repetition and regularity of the activity, whether the business is planned and organized in a businesslike manner, the size, scale and permanency of the activity, etc. Primary producers receive many taxation benefits over non-primary producers, encouraging landowners to become primary producers, and thereby encouraging more sustainable forestry practices. Among the benefits of being a primary producer are: the ability to base the rate of tax on a moving average of incomes to reduce the effect of yearly income fluctuations, and additional deductions allowable for primary production activities.

AC * Hibbard, Calder, M., Michael A. Kilgore, and Paul V. Ellefson. 2003. Property Taxation of Private Forests in the United States. *Journal of Forestry*. 101: 44-49.

This article covers property tax policies in place all over the nation. There are several forms of property taxes that are in place, including:

- *Current use*. This form of property tax is the most common tax on land, assessing timberland for its use as timberland and not the full market value. There are several methods of determining the current use of land, including income capitalization formulas, administratively or legislatively determined values, and the annual rate of increase in stand

value. Income capitalization formulas are the most popular processes of valuating land for current use tax purposes, usually these values are based on a range of soil or land productivity classes.

- *Ad valorem*. This is the second most popular form of property tax, and usually carries with it a reduction of some percentage for timberland. The reduction spans up to 50% of the full market value.
- *Flat Tax*. Nine states have flat tax programs established, eight of which are in the northern states. This program levies a single rate on forestland despite its full market value or productivity value, tax rates range between $0.50 and $3 per acre per year, averaging out to $1.16 per acre per year.
- *Tax exemption*. Only Alaska, Iowa and Delaware exempt qualifying woodlands from property taxes. In Alaska, most private forestland is exempt from property taxes indefinitely; while Iowa exempts certain forests for up to eight years. Private forests are exempt from property taxes in Delaware indefinitely and commercial forest plantations are exempt for 30 years.
- *Hybrid programs*. Three southern states employ hybrid programs using both current use and ad valorem programs to provide incentives for sustainable forest management. All three programs combine the two valuations, Georgia for example bases forestlands' taxable value 65% on current use and 35% on full market value.
- *Additive taxes*. Many property tax programs are accompanied by either yield or severance taxes, more often yield taxes are levied, and mostly in the north. Yield tax rates tend to vary between 0.13% and 10% of the value of harvested lumber while the most common rate is 5%. Severance taxes are more common in the south and the west and rates depend on the species of tree or type of forest product.

For most programs, the parcel of land must meet certain requirements, such as being under a management plan, and remaining in the program for a number of years, and there are usually penalties for noncompliance with the terms and conditions of the programs; the penalties in most cases are the differences between the tax breaks received and the normal taxes that would be paid if the land was not enrolled in the program, some including interest, with the rate varying between 6 and 9 percent.

AC *** Idaho State Tax Commission. 2005. Forest Land Taxation Law 2005. [online]. Idaho State Tax Commission: Boise, ID [cited July 2005]. Available from World Wide Web: (http://tax.idaho.gov/propertytax/PTpdfs/BR_forestlandtaxlaw05portrait.pdf).

The new tax laws regarding forestland in Idaho are covered in this publication. Forestland owners have two choices when it comes to property tax policies in Idaho; a Productivity Tax or a Bare Land and Yield Tax. The productivity tax

is based on the average growth in board feet per acre on timberland. There are four Forest Value Zones in Idaho for which there are set rates for the three classes of forestland. In Zones one and two, poor forestland grows on average 125 board feet per acre, 225 is medium and 350 is good; in zones three and 4 125 is poor, 213 is medium and 320 is good. Landowners pay 1% of the productivity values. The other option for landowners is the Bare Land and Yield tax; land, also graded on the same system of good, medium and poor, is taxed yearly merely on the value of the bare land, and then later, at the time of harvest, a yield tax is imposed on the stumpage value. The bare land tax is 1% of the bare land values included in Appendix C, and the yield tax is 3% of the stumpage value of harvested timber.

ACG ** Illinois Forestry Development Council, IDNR. 2001. Illinois Forestry Development Act: Information Sheet. Illinois Forestry Development Council, Springfield, IL.

The Illinois Forestry Development Act includes several policy measures undertaken in Illinois to ensure sustainable forests. There is a cost share program, which provides funding for forestry activities to landowners with 5 acres or timberland or more. Also included in the act is a tax incentive program which values any land being managed under a forestry management plan at 1/6 of its assessed value, so landowners under a forest management plan pay only 1/6 of the normal property tax value; for example, if a tract of forest landowner was required to pay $6,000 in property taxes, the landowner would only pay $1,000 in property taxes, if the land was under a management plan. The FDA amended the Timber Buyers Licensing Act, requiring that when harvested wood is sold, the buyer shall determine the amount to be paid for the wood, and deducts from the payment to the grower 4% of the purchase price; this money goes to the DNR to the Forestry Development Fund and is used for the cost share program and expenses of the council.

A *** Kilgore, Michael A. 2002. “Minnesota’s Sustainable Forest Incentive Act: A Landowner’s Guide.” *Natural Resource Reports*. 1: 1-7.

This article covers the Sustainable Forest Incentive Act (SFIA), explaining it to landowners so that they can make an informed choice to become members of the program. The tax program provides relief from property taxes, but not through reductions in value or tax credits, but by a check directly from the Department of Natural Resources. This program is run independently of the tax auditors and assessors, it is controlled by the DNR and separate from the property taxes. Local assessors will still value the land for its best use, and landowners will still pay the best use taxes, but some of that money will be

returned to the forestland owner by the DNR. To be enrolled in the SFIA a forest property must be at least 20 contiguous acres, have a forest management plan that has been updated in the past ten years, by a designated "approved plan writer" designated by the DNR. Land must be enrolled in the program for at least eight years, and there cannot be any delinquent property taxes on the land. If a land is larger than 1,920 acres, that land must be open all year long for public access to fish and wildlife resources, public access can be nonmotorized. Only land enrolled in the program larger than 1,920 acres must be allowed public access, not just when a parcel exceeds 1,920 acres, land on a parcel not enrolled in the program may be closed off to the public. There are three methods for determining what the incentive payment will be; whichever payment is the highest per acre is the payment used by the DNR.

- *Method 1: Property Tax based on Market vs. Current Use Value.* The incentive payment for this method equals the difference between the assessed market value of the average acre of timberland (using the most common class of timberland) and the average current use value.
- *Method 2: Two-thirds of Average Forest Property Tax.* Incentive payments will equal two-thirds of the previous year's state average property tax per acre (using the most common class of timberland).
- *Method 3:* Minimum incentive payments for the program will be $1.50 per acre.

So assuming that the most common class of timberland in Minnesota, 2b, is $5.00 per acre, and the current use value of the land is $4.00, the incentive payment per acre would be:

- *Method 1*: $5.00 - $4.00 = $1.00
- *Method 2*: $5.00 x 0.67 = $3.35
- *Method 3*: $1.50

The incentive payment for that year from the DNR would be $3.35 per acre, because two thirds of the ad valorem value was higher than the result of the other methods. If land is found in violation of the program, then the landowner is terminated from the program, after a 60 day appeal period, and if the land is terminated from the program, the owner is required to repay the DNR the incentive payments from the last four years, plus interest.

FG * Kilgore, Michael A., Charles R. Blinn. 2004. Policy Tools to Encourage the Application of Sustainable Timber Harvesting Practices in the United States and Canada. *Forest Policy and Economics*. 6: 111-127.

Within North America there are a variety of different policy tools that are used to encourage good forestry, most include technical assistance and education, there are however, a few programs that use financial incentives other than the standard tax breaks. Three states have policies that provide premium prices for products, and two states give preferential access for contracts and loans to landowners and loggers committed to sustainable forestry. The article does not

go into any details about how the programs work, and does not even give examples of programs; but their effectiveness is rated by the article for loggers and landowners, and the price premium and preferential contracts are more effective with loggers than with landowners in encouraging sustainable harvesting practices, and technical assistance and education are by far the most effective tools for foresters, loggers and landowners. Though not covered in the article extensively, taxes as fiscal incentives to promote good forestry "found their effectiveness and efficiency the highest of those policy tools studied." This contrasts with the premium pricing and the preferential contracts which produce more than is invested into them, however not a great deal more, and according to some, foster hard feelings within the logging community. In the appendix, several tables from this article are included that show the variety of programs that are used, and where they are used, as well as their effectiveness and efficiency.

ADG ** Klosowski, R., T. Stevens, D. Kittredge, D. Dennis. 2001. Economic Incentives for Coordinated Management of Forest Land: a Case Study of Southern New England. *Forest Policy and Economics*. 2: 29-38.

This article is the result of research done by the authors to determine what sort of economic incentives would be worth which resulting tradeoffs, i.e. harvest restrictions, public access to land, etc. fifty-seven landowners participated in this study. The study included sixteen variations of a basic economic incentive plan with the following variables:

- *Harvest restrictions*: on a certain portion of forestland, harvest would be prohibited for the duration of the program
- *Public access*: the landowner would either be required to allow public access to trails on timberland, or would not be thus required.
- *Tax breaks*: land would be valued at a fraction of the full market value for taxation purposes.
- *Length of program*: the land would be committed to the program for a certain number of years.
- *Penalties*: if land was withdrawn from the program early, due to infractions of the stipulations, penalties could be dealt to the landowner.

A table of the sixteen different variations of the incentive plan is included in the appendix; participants in the survey responded to the different programs by ranking the variations on a scale of one to nine (1 = definitely would not participate, 9 = definitely would participate).

As expected, interest in the programs increased as the tax benefits increased, and likewise decreased when the length of commitment and penalties increased. Smaller landowners were much less interested in enrolling in any of the programs than landowners with larger tracts, and landowners who were

involved with a forestry association, or enrolled in the Stewardship Incentive Program responded more positively to the different programs than owners who were not as involved. When asked whether the landowner would definitely enroll or not enroll in a program, penalties and total acreages of plots were not important, what was very important was the effect of the program on harvests, and the lowered harvest revenue that a landowner would receive while enrolled in the program. In conclusion, the likelihood of actual enrollment in the programs by a large number of NIPF owners is small; however "this analysis does suggest ways in which coordinated programs might be marketed." For example, programs will be much more popular with larger tax incentives and short commitments; requiring of open public access to lands did not play a significant role in landowners' decisions on the different programs, so any sustainable forestry programs that are established should require public access to lands, because this will not dissuade a significant portion of forest land owners from enrolling in the program.

AC *** Koskela, Erkki, and Markku Ollikainen. 1997. Optimal Design of Forest Taxation with Multiple-Use Characteristics of Forest Stands. *Environmental and Resource Economics*. 10: 41-62.

This paper studies socially optimal forest taxation when forest landowners value the amenity services of forest stands and these forest stands have public goods characteristics. The optimal tax policy in this case would be a site productivity tax combined with a yield tax at harvest. The site productivity tax is a lump-sum tax levied independently of harvesting; while the yield tax is a proportional tax levied on timber revenue. Three different circumstances are examined using complex economic equations to determine the results positive, negative, or neutral of the site productivity tax and yield tax; the different circumstances include certain and uncertain timber prices with private valuation of amenity services, and simply private values of amenity services. Several different methods of taxation are proposed: a Ramsey-Pigou tax system with social insurance, Pigouvian taxation with public goods characteristic of forest stands. Throughout the article are complex equations describing the taxation methods, results of current and future harvests under different circumstances, and even equations to describe forestry processes. The end result of the taxation system is that current harvests will not be affected, but future harvest rotations will be extended, and protect amenity values and public goods produced by affected forests. Included in Appendix B is a table of equations from the article, however, not all of the equations are included.

AC **** Landgren, Chal G. 1997. Taxes and Assessments on Oregon Forest Land and Timber. Oregon State University Press, Corvallis, OR.

This is a report of the historical and current taxes on timber and timberlands. During the Depression, Oregon passed a law called the Forest Fee and Yield Tax program, but it was also known as the Reforestation Act. Because timberland owners were in such financial difficulty, a low, flat tax on all land was established regardless of the value of the land, in Eastern Oregon the rate was $.05 and in Western Oregon $.10. A yield tax was established, but only had to be paid when there was a harvest, so that the poor landowners only paid high taxes in years that they harvested and sold timber; however it also served to help reforestation, hence the nickname. There are also several other tax policies listed, though these are standard property taxes based on percentages of land value, and timber taxes of a certain percentage of the harvested timber value.

- The Western Oregon Small Tract Optional Tax, or WOSTOT, is an annual tax based on the forest land's true cash value. The land is assessed every year by the Oregon Department of Forestry for five site classes of forest land, only land between 10 and 2,000 acres is eligible for entry into this program. There is no privilege tax due at harvest on harvested timber, because the timber and the land are taxed as a single production unit. The tax equation for 50 acres valued at $710/acre with a district tax rate of $10 per $1,000 would be:
  - 50 acres x $710/acre = 35,500
  - ($35,500/$1000) x $10 per $1000 of assessed value = $375
- The Western Oregon Forest Land and Privilege Tax (WOFLAPT) is an annual tax based on forest land use rather than cash value of the land. The more productive land is for growth, the higher the valuation. Annually, 20% of the valuation is paid in the form of property taxes, while theoretically the remaining 80% is recovered in the form of the Western Oregon Privilege Tax, due at harvest. So, if a 50 acre plot is valued at $710/acre, and the tax rate in the district is $10 per $1,000 of assessed value, then the equation is as follows:
  - .20 x $710/acre = $142/acre
  - 50 acres x $142/acre = $7,100
  - ($7,100/$1,000) x $10 per $1,000 of assessed value = $71
- The Eastern Oregon Forest Land and Privilege Tax (EOFLAPT) is a little different from WOFLAPT in that all forest land is assigned the same valuation, $47.91 per acre. The tax equation, assuming the same figures as above, would be as follows:
  - .20 x $47.91/acre = $9.58/acre
  - 50 acres x $9.58/acre = $479
  - ($479/$1000) x $10 per $1000 = $4.79
- The Forest Products Harvest Tax (FPHT) is a harvest tax paid by every landowner, and is the same all over Oregon. The owner of the timber at the time of the harvest is the person responsible for filing the tax.

The rate in 1996 was $2.11/MBF, and the first 25 MBF of the harvest were exempt from taxes.

- The Western Oregon Privilege Tax (WOPT) is levied in addition to the FPHT and is assessed, as of 1997 at 3.2% of the taxable value. The taxable value is determined by subtracting allowable logging costs, which for the DOR in 1995 was $190/MBF from the total gross sales amount. Lands under the WOSTOT program are exempt from this tax.
- The Eastern Oregon Privilege Tax, or EOPT, is the same as the WOPT except that allowable cots were $165/MBF in 1995 and the tax rate is 1.8% of the taxable value.

EG ** Lindstad, Berit Hauger. 2002. A Comparative Study of Forestry in Finland, Norway, Sweden, and the United States, with Special Emphasis on Policy Measures for Nonindustrial Private Forests in Norway and the United States. General Technical Report. Portland: USDA Forest Service Northwest Research Station.

This report focuses on the similarities and differences between Norway and the United States in the forestry sector. For example, the taxation policies in Norway have a more direct influence on forestry than in the United States, which play a minor role in governing forestry. The problem of fragmentation in the United States due to the estate tax does not occur in Norway, because the land is valued based on growing trees instead of the most valued use of the land. It covers different laws for environmental and forest protection enacted by both countries, as well as several policies to help promote good forestry. The Forest Trust Fund of Norway is mentioned, which is the mandatory deposit of a percentage of timber sale profits, between 5 and 25%. The interest accrued from the trust fund is not given to the landowner; it is used by the Ministry of Agriculture for "the common benefit of Norwegian forestry." The money usually is distributed to forest authorities around the country and used to fund "information activities, extension services, etc." Hauger concludes that more financial assistance from the government is issued in Norway than in the United States, despite the disparity between the amounts of forest land.

ABDG *** ME Dept. of Conservation, ME Forest Service. 2004. Complementary Solutions to Liquidation Harvesting. ME Dept. of Conservation, ME Forest Service, Augusta, ME.

A detailed report to the 121st Maine Legislature outlining possible programs and policies that would encourage landowners to consolidate land plots and hold onto forested areas for long-term growth and sustainability. The report

claims that several steps must be taken in order to provide the proper encouragement. These steps include:

- Loan guarantees: state-guaranteed loans for the purchase of timberland provided that the recipient commits to sustainable silviculture
- Incentives for consolidation: reduced real estate transfer fees for landowners who consolidate parcels by acquiring abutting forestland, and commit to sustainable forestry
- Reduced taxes on capital gains: reduce state capital gains tax on sales of forestland held for long term management
- Timberland investment using retirement funds: establish a mechanism to encourage investment of Individual Retirement Accounts and similar funds in long term managed forest properties
- Sustainable Forestry Revolving Loan Fund: establish a means of funding landowner forest management plans and certification costs for landowners
- Property tax rebates: a property tax rebate program exists in Minnesota that could potentially work in Maine to foster long term forest management
- Reduced estate taxes: use mechanisms that mitigate estate taxes where they impede continuation of sustainable management.
- Subdivision of liquidated lots: prohibit subdivision of parcels that are found to have violated liquidation harvesting rules

Other answers, though specifically for the issue of liquidation harvesting are the reduction of market for liquidated wood, and further education on the impact of liquidation harvesting and the need for sustained forest management.

A*** Minnesota Forest Resources Council. 2000. Minnesota Forest Land Tax Policies: recommendations for reform. Minnesota Forest Resources Council, St. Paul, MN.

This report proposes new timberland taxation that encourages Minnesota forest landowners to use practice good silviculture with forested land. The preexisting taxation system in Minnesota was biased and encouraged landowners to harvest lumber on shorter rotations because the property taxes would rise each year as the quantity of lumber increased; there is more lumber that can potentially be harvested and sold, and therefore the property is worth more, which translates into higher taxes. The council recommended simplifying the classes of rural property containing forest, agricultural or other wild lands into one “rural” class in order to simplify the system as well as provide more taxation equity. The council also proposed a new tax law, the Sustainable Forest Tax Law. This law would exist independent of the local property tax and be administered by the state. Landowners who commit to long-term sustainable forest management would receive reduced tax liability,

which would lead to a partial refund of property taxes and a reimbursement for the costs of forestry investments. The amount of this refund would be based on the difference in the amount of property taxes paid, and the current use value of the land, the refund would amount to the difference between the land's estimated market value and the lower of these two options: its current use value, or one third of its full estimated market value. The ad valorem system would remain, however this program would replace the Tree Growth Tax Law.

AC *** Minnesota Office of the Revisor of Statutes. 2004. *Minnesota Statutes 2004*. [online]. Minnesota Office of the Revisor of Statutes: St. Paul, MN [cited July 2005]. Available from World Wide Web: (http://www.revisor.leg.state.mn.us/stats/88/).

The state of Minnesota has specific policies regarding land under the definition of auxiliary forest. An auxiliary forest is defined as a state forest, and any privately owned tract of land, whose use is devoted to the production of timber or forest products. Parcels of land must apply to become auxiliary forests and thereby reap the taxation benefits of being an auxiliary forest. The annual tax of auxiliary forest land is ten cents per acre; and there is a yield tax levied in the event of a harvest. The yield tax rate is 40% of the market value of the merchantable timber on the stump at the time of the cutting or removal. Every year the tax rate is reduced by 2% until it reaches 10% and thereafter shall remain at 10%.

BD ** National Association of State Foresters. 1999. *Taxation and Forest Sustainability: Recommendations for Positive Change*. [online]. NASF: Washington, DC [cited June 2005]. Available from World Wide Web: (http://www.stateforesters.org/positions/forestland_taxation.html).

This is a resolution from NASF that resulted from the 77th Annual Meeting in Harrisburg, PA. The NASF declares that there are several policies in existence which harm sustained management of forests, one of these is the estate tax, which in reality encourages fragmentation and early harvesting. Several possibilities exist that the government could utilize to promote better management of the nation's private forestland. The first option is to remove the estate tax altogether from tax laws, since it makes up a minimal amount of the federal budget; a less drastic measure would be to reduce the amount of taxes levied, to prevent poor management and yet not eliminate that source of income for the government entirely. Payment on estate taxes should be deferrable for recipients who pledge to employ good silviculture on the timberland for a period of time. The annual gift tax exclusion should be

indexed for inflation, and increased outright in order to protect poorer landowners without liquid assets from the burden of the tax. Income taxes also propose a problem to landowners, "lump sum" timber sales are not considered a capital gains transaction, and not included in the capital gains tax, this discourages sustainability in forestland and should be remedied by qualifying lump sum timber sales for capital gains.

AC ** Nielsen, Carol and Stefan A. Bergmann. 2004. The Managed Forest Law Property tax Program. University of Wisconsin Press, Madison, WI.

The MFL Program in Wisconsin is very similar to other incentive based tax programs. Forest land owners who agree to a sustained management plan for 25 or 50 years receive tax benefits. Land that is accessible to the public and declared open receives further tax benefits. Taxes on forest lands that are enrolled in the program after 2005 and are closed to the public are $7.28 per acre; whereas taxes on open lands are only $1.46 per acre. During the first five years of enrollment, landowners are exempt from any yield tax after a harvest, but before a harvest all owners must submit a cutting notice, as well as a cutting report after the harvest, and from the report if the land is eligible, yield taxes will be assessed, not on the profit, but based on the volume and average price of the wood itself. The Department of Natural Resources every year reports average stumpage prices for various different types of wood. The yield tax would be 5% of the volume multiplied by the average prices reported by the DNR; so if a landowner sells 50 MBF priced at $50/MBF by the DNR, the yield tax will be $125, even if the landowner sells the wood for more than $50/MBF.

A *** Ohio Division of Forestry, ODNR. 2005. *Tax Laws* [online]. Columbus: Ohio Division of Forestry, ODNR [cited June 2005]. Available from World Wide Web: (http://www.dnr.state.oh.us/forestry/Landownerasst/tax.htm).

Forestland in Ohio under the Ohio Forest Tax Law program could possibly receive a 50% property tax reduction, if the qualifications are met. There are several requirements, including: a plot must have 10 acres of contiguous forestland, it must have a forest stewardship management plan, and land must be accessible for management. These are the requirements for entry into the program, and every five years an assessor will travel to the land to determine whether or not the owner is in compliance with the management plan. Other requirements of the landowner involve protecting land from livestock, attend at least 8 hours of forestry training within the first five years of certification, use an Ohio Forestry Association Master Logger when harvesting timber, and timber can only be harvested as per the forest stewardship plan; lastly, the area

under the plan must be devoted exclusively to forestry, and its allied fields (timber production, maple syrup production, wildlife conservation, etc.) only when these do not conflict with the productiveness of the forest.

CEG ** Øistad, Knut. 2001. Financing Sustainable Forest Management in Norway. Ministry of Agriculture, Oslo, Norway.

This is a report from the International workshop of experts on financing sustainable forest management. The report highlights Norwegian methods of encouraging good long-term silviculture among private landowners. One method is the Forest Trust Fund; this is a tax on the sale of timber, in Norway between eight and twenty-five percent of the gross value of the timber. This money is put in a local bank in a trust fund account in the owner's name, however the Norwegian Forestry Department has overall control for managing the funds and allowing the use of these funds. The money is a "mandatory reinvestment" that stays with the land and aids in the maintenance and restoration of the land as forestland. Funds are used for various forestry activities such as planning and building forest roads, reforestation, The money in the trust fund is tax deductible, and when the funds are applied to silviculture, part of those expenses is also tax deductible. Public funding also exists in the form of cost share programs and grants to aid landowners in responsibly managing their forests for long-term sustainability.

ABCD ** Pierce, Louis. 2003. Tax and Related Incentives for Forest Management. Legislative Research Commission: Frankfort, KY.

This report is the result of a research project to find fiscal policy instruments that promote sustained forestry. Only under federal law is standing timber considered a capital asset, states should also include timber as a capital gains, and have provisions for capital gains, in Kentucky timber is deemed a capital asset, but there are no tax rates for capital gains, so there is no incentive to maintain capital assets. Property taxes without policies that assist timberland have always been a major disincentive for sustainable forestry, however there are several alternatives for that problem, including:

- Lowering tax rates: lower rates of taxes on forest lands to more fairly assess the value of the land for its use as timberland.
- Employing a productivity tax: this tax is based on the "capitalized value of the gross or net mean annual revenue from a forest." This tax stays constant every year because it is based on productive potential. Timber volume is multiplied by stumpage price to arrive at a value for the property based on revenue producing potential.

- Site Value Tax: this tax separates the trees from the land and taxes only the land, usually combined with a yield or severance tax.
- Exemption: Some states exempt forest tracts partially from property taxes. Ohio exempts 80% of a parcel's value when the value is over $40 per acre, Alaska, Delaware, Iowa, and New York also have similar programs
- Yield and severance taxes: taxes that are levied on tree harvests; yield taxes are assessed on the value of harvested trees, typical countrywide range is from 3% to 10% of the value. Severance taxes are assessed on the volume of the harvested trees.

Estate taxes and their numerous problems are mentioned, but no alternative policies are proposed. The report also covers cost share and assistance programs such as the Forest Land Enhancement Program, the Forest Legacy Program, the Conservation Reserve Program, and the Wildlife Habitat Incentives Program, all of which are cost share programs that cover some of the costs of reforestation and other forest management activities. The Forest Stewardship Program and the Sustainable Forestry Outreach Initiative, the former is simply a technical assistance program providing help with stewardship plans on forest land greater than 10 acres; the Sustainable Forestry Outreach Initiative is an education program as well as assistance program, teaching landowners about the benefits of sustained management as well as the processes and methods of good forest management. Another proposal discussed in the paper is the idea of Green IRAs, or GIRAs, the report cites DeCoster and illustrates one of his examples.[1] The USDA Forest Service did an analysis to determine the effects of a GIRA for a 45 year old southern pine rotation on 10 million acres of land; the results were 12% increased tax revenues and 20% increased landowner profits.

D ** Siegel, William L., H.L. Haney Jr., D.M. Peters, P. Bettinger, D.S. Calligan. 1996. The Impact of Federal and State Income Taxes on Timber Income in the Northeast and Midwest Following the 1986 Tax Reform Act. *Northern Journal of Applied Forestry*. 13 (1): 8-15.

This article covers the income tax policies both at the federal level, and at the state level. Several states have implemented policies that treat timber as a more long term investment, thereby promoting sustained forestry. Since the federal government eliminated the long term capital gains exclusion policy, many states have done the same thing; however several states, including Maryland, Iowa, Massachusetts, and Wisconsin allow exclusions from long term capital gains income, ranging from 30% in Maryland, to 60% in Wisconsin. Most

[1] The reference mentioned is: DeCoster, Lester A. 1995. Maintaining the Public Benefits of Private forests Through Targeted Tax Options. Forest Policy Center, Washington, DC. It is annotated earlier in the document; the example mentioned is also covered with the annotation.

states base taxable income on the federal definition of adjusted gross income. However there are some states who follow slightly different methods; Rhode Island and Vermont, for example use federal income tax liability, and Minnesota uses federal taxable income as its base. New Hampshire only levies income taxes on interest and dividend income; however New Hampshire also imposes taxes on proprietorships and partnerships using a flat 7.5% business profits tax, and a business enterprise tax at 0.25% of the value of every taxable entity. Iowa and Missouri have policies that exclude federal income taxes from state taxable income; this substantially lowers the amount of taxes paid to the state by the landowner. After analyzing a hypothetical situation, a $50,000 timber sale, Pennsylvania taxed the gains from timber sales the least, at a 2.8% maximum effective long term capital gains tax rate and no personal exemptions; next was Illinois with $1,000 in personal exemption and a 3% maximum effective long term capital gains tax rate. Maine came in toward the higher end of the scale, taxing long term capital gains more than most states; with $8,450 in exemptions, 2% tax on the first $8,250, and an 8.5% tax on the remaining revenue.

CG *** Teisl, Mario F., Andrew J. Plantinga, Thomas G. Allen, David Field. 2001. Funding Forest Certification. *Choices: Ideas for Shared Prosperity*. Vol. 7, No. 4: 1-8

This article covers the problem of certification of Maine's forests, many Maine landowners would like to certify, but the costs are too high for them to afford certification. A severance tax is proposed the funds from which would go toward government subsidies of certification costs. The subsidies would go to landowners with more than 20 acres of forestland and less than 500 acres of forestland. There are several tables and figures, included in the appendices, which show the probable amount of increase in acres of certified forest land, the cost of the program to the state, and the projected tax rates for different types of trees and products. The severance tax would need to raise enough money to cover the annual amortized cost of the initial audit subsidy, as well as the cost of the re-certification subsidy. The severance tax rate would depend on the level of the subsidy, if a 50% subsidy program was established, then the rate should be between 0.2% and 0.4% of the total value of wood harvested on forestland of at least 20 acres; however if a full subsidy was established, than the rate would need to be between 1.2% and 2.9% to cover the costs. The affects of the severance tax on middle landowners is minimal, because the money saved from the costs of certification offset the losses. However large landowners, with 5,000 acres or more would be affected quite a bit by such a severance tax, because a very large majority of the harvested timber comes from the large plots; the tax burden shift increases very drastically as plot size increases. However with the subsidies in place, at the lowest estimate with a 50% subsidy, almost half a million acres would be certified, almost doubling

the amount of certified acreage; with lowest estimates at full subsidy, over one million acres of land would be certified.

AD ** University of New Hampshire Cooperative Extension. 2004. *Guide to New Hampshire Timber Harvesting Laws*. University of New Hampshire Press, Durham, NH. 37 p.

This guide to tax and timber harvesting laws provides an overview of the legal system for forestry in New Hampshire. New Hampshire has the current use tax law that gives landowners the incentive to keep land undeveloped and under forest cover; there are also further benefits to private owners who allow the public access to the land for a variety of activities, though this is not required. Instead of taxing the current use land at its real estate market value, the land is taxed on its income producing capability, land enrolled in current use is not assessed as a potential site for houses, merely as timber or farmland. There is also the timber tax law; which taxes timber as real estate, but it is only taxed when it is cut and "at a rate which encourages the growing of timber." Timber on all land ownership is taxable at 10% of the stumpage value at the time of cutting.

ABD ** Wear, David N., Greis, John G. 2002. The Southern Forest Resource Assessment. USDA For. Serv. Gen. Tech. Rep. SRS-53. 635 p.

The Southern Forest Resource Assessment was a research project undertaken by the southern research station of the USDA Forest Service, investigating several aspects of sustainable forest management. One of the elements researched was the government's role in influencing forest management. Chapter eight of the extended technical report is dedicated to policies, regulations, and laws, including federal income and estate taxes, cost share programs, property tax valuation, etc.

- Federal Income Tax: Income tax incentives in place today include deductions of reforestation expenses, capital gains tax treatment of timber sales, tax credits on amortization (10% tax credit over 8 tax years up to $10,000 of reforestation expenses per year). Also, the project researched and analyzed the effects of incentives that have been proposed, but not established.
    - Income averaging: the program that was analyzed allows forest owners to treat income from a thinning or harvest as three equal annual installments, beginning in the year of the sale. The profits from the timber sale are split into three smaller amounts, under federal income tax rules income above a certain amount

is taxed at a higher rate than if under the specified amount, if the landowner is allowed to divide the income from the timber sale into three parts, the tax rate is lower.

- Reducing tax rates for long term capital gains: the incentive policy that was analyzed would reduce the rates of income taxes on capital gains further than already established. The rates would be lowered to half of the rates for ordinary income; there would be no effect on state taxes, the owners would receive more benefits and states would not lose any tax dollars from the proposition. A table is included in the appendix that shows the effects of the proposed incentive.
- Enhancing amortization provisions: The need for landowners to capitalize the high up-front cost of forest investments can be reduced by increasing the amount of reforestation expenses that may be amortized and shrinking the recovery period from eight years to six.
- Permitting deduction of reforestation expenses: allowing owners to deduct forest expenses as they occur removes the need for capitalization of the up-front costs that come with sustained forest management.
- Establishing Green Accounts: The research station looked into two green account policies, GIRAs, and a plan modeled after "the cafeteria-plan Medical Saving Accounts" the benefits to timberland owners are better than with the deduction of reforestation expenses, because pre-tax money goes into reforestation expenses, but with green accounts and likewise with deduction of reforestation expenses, no benefit would go to owners whose expenses can be fully amortized.
- Stewardship investment tax provisions: The IRC only provides tax incentives to forestlands that are being used to produce marketable goods, despite the fact that a significant portion (which is growing) of NIPF owners manage land solely for social and environmental benefits. Including these types of owners in four of the provisions of the IRC would assist such NIPF owners manage forests, which is an expensive venture. The areas include:
    - Reforestation tax credits for owners receiving cost share assistance, and the ability to amortize out-of-pocket expenses.
    - All owners receiving cost share assistance may exclude from gross income the full amount of the payment permitted under Section 126 of the IRC and Section 212 for forest management practices and establishing trees.
    - Owners should be able to deduct the full amount of the basis in trees lost to casualty, condemnation, or theft.

- Federal Estate Tax: The estate tax, which is levied on the transfer of wealth and property from generation to generation, there are however, exemptions from this tax; estates that are lower than or equal to a certain amount are not taxed, so that specifically land parcels belonging to middle and lower class families were not fragmented. The Economic Growth and Tax Relief Reconciliation Act of 2001 increased the exemption from $675,000 to $1 million beginning in 2002, and the highest tax rate was supposed to be gradually lowered 10% until 2009 from 55% to 45%.
- Current-Use Property Valuation: Use value taxation programs essentially come in three forms: preferential assessment, deferred taxation, and restrictive agreements. Pure preferential assessment does not penalize land that is converted to a use not allowed in the program, the land simply becomes valued again at the full market price. Under a deferred taxation program, such land is penalized to the amount of taxes saved during some or all of the years that the land was in the program, and possibly with interest. Restricted use agreements bind a landowner to the program for a number of years, during which the land is valuated at current use, and after which land can either be reentered into the program, or once again return to ad valorem taxation. The most widely used method for determining current use value is through income capitalization. The two main variants of income capitalization are the sustained-yield approach and the bare-land-value approach. Bare land value may also be known as land expectation value, with this approach a stand is, or is assumed to be, established on cutover land, grown until mature enough for harvest, then harvested and repeated. The value is: "equal to the present net worth of an infinite series of periodic incomes." The standing timber is exempt from taxation, usually until harvest, when a yield or severance tax is levied. The sustained-yield approach uses the net value of the mean annual growth increment, as if it were annual income, with a specific rotation length. The impacts of current use valuation are assessed according to three categories: equity, revenue, and the effectiveness of current use valuation in preventing forest land owners to submitting to development pressures.
    - Equity: When current use methods are codified into tax policies, forestland owners pay less in property taxes than before, this reduces income, substantially in some areas, and the revenue needs to be replaced by other taxes. "Local government taxing bodies normally respond to the resulting decrease in the tax base by increasing tax (millage) rates. The taxes of nonparticipating owners rise, and they collectively share a greater proportion of the total tax burden."
    - Revenue: Local governments might not have the ability to increase tax rates in order to offset the lower tax monies resulting from the current use tax laws. In Georgia, when

current use valuation was implemented in 1992, some counties lost up to 20% of their taxable base, which created problems because property taxes are the primary source of local governmental income.

- Effectiveness: Current use based property taxes standing alone cannot keep land from being developed. Though the benefits are quite substantial to landowners, in the end development may only be delayed, not prevented; because of the major profits that come from converting land into non forest uses.

ABD ** Ylitalo, Esa. 1998. Forest Taxation in Finland—a review of the systems currently in use. Finnish Forest Research Institute: Helsinki.

This report covers the system of taxation in Finland, which underwent a change in 1993; when the system where forest income taxation was based no longer on the average value of the annual increment, it became based instead on capital based income. Now actual stumpage revenues form the basis of income taxation in Finland. After the switch was made however to the capital income system, there was a transition period of thirteen years where landowners were allowed to remain on the old system of taxation in order to adjust properly to the new income tax policies. When the new law was enacted, income was divided into two different categories, capital income, and earned income. Actual stumpage revenues for forest income consist of: revenues from stumpage sales, value of delivery sales, value of timber used for personal purposes, and forest insurance compensation and other compensation for forest damage. There are several expenses which are deductible from forest capital income, these are: annual real expenses in forestry, annual expenses of prolonged investments, and forest deduction. *Forest deduction* is the term used for the purchasing price of new forest land, it is partly deductible and therefore called a forest deduction.

Finnish property taxes are based on the annual assessed average yield, but to determine the annual assessed average yield, one must return to the annual taxable increment; on which the previous system of income taxation, area based taxation, was based. It is from the annual taxable increment that the cutting savings is determined, and from the cutting savings one can calculate the net unit value, and then from the net unit value comes the annual assessed average yield. Examples and tables for determining all of these are included in the appendices, as well as a table comparing and contrasting the two income tax systems, and a model for the area-based forest taxation system.

- *Annual Taxable Increment*: the annual taxable increment can be found by multiplying the average increment of growing stock, by the area of the land. Though in the appendix the equation appears more complex, dividing land into site classes, the end result is the same as if the total

average growth were multiplied by the total area of forested land, excluding ineligible land such as roads, area under power lines, etc.

- *Net unit value of the annual increment*: There are several factors that go into the net unit value of the annual taxable increment; they are: stumpage prices, structure of growing stock, cutting savings, forest insurance and damage compensation, and average expenses incurred in wood production. The gross unit value is determined by multiplying the average stumpage prices by the structure of the growing stock; example 2 in the appendix shows this equation, though it can be misleading. The value for the structure of the growing stock, which is given as a whole number, is in fact a decimal; for example, the stumpage price for pine was 250,000 FIM, and the structure of the growing stock was 25, and the result of the multiplication was 62.5, in order to come up with this result, we must move the decimal point on the 25 so the value is in fact 0.0025. After the gross unit value is obtained, then the cutting savings are subtracted from the gross unit value, as well as the deductible expenses, forest insurance compensation is added, and the result of this equation is the net unit value of the annual increment. Cutting savings are defined as the difference between the allowable cut and the outturn. The commercial roundwood production is subtracted from the total increment of cordwood, this result is the cutting savings, and is then divided in half for the calculation of the net unit value.
- *Annual assessed average yield*: The annual assessed average yield comes from the multiplication of the total volume of annual taxable increment, and the net unit value of the annual increment.

After all of these different factors are determined, the property taxes that will be levied on a tract of forestland can be determined. The value that property taxes are based upon can be found by taking the annual assessed average yield and multiplying it by ten. "This value covers both the forest land as well as the growing stock." For any property valued at FIM 1,100,000 or more there is an automatic tax of FIM 500, and any property valued higher than FIM 1,100,000 is additionally taxed at 0.9% on the value exceeding the limit. Any property valued lower than FIM 1,100,000 is not taxed.

Appendix A

Table 1-4. Alternative forest land values ($ per acre) for assessments done between January 1, 2000 and January 1, 2006 as prescribed in Idaho Code (§ 63-1705(5)).

		Productivity Class					Productivity Class		
Year	Zone	Good	Medium	Poor	Year	Zone	Good	Medium	Poor
2000	I	733	470	207	2003	I	564	361	159
	II	700	449	198		II	539	346	152
	III	553	368	172		III	426	283	132
	IV	379	252	117		IV	291	194	90
2001	I	676	434	191	2004	I	507	325	143
	II	646	415	183		II	485	311	137
	III	511	339	159		III	383	255	119
	IV	350	232	108		IV	262	174	81
2002	I	620	398	175	2005	I	451	289	127
	II	592	380	167		II	431	277	122
	III	468	311	145		III	341	226	106
	IV	321	213	99		IV	233	155	72

Source: Idaho Code § 63-1705(5).

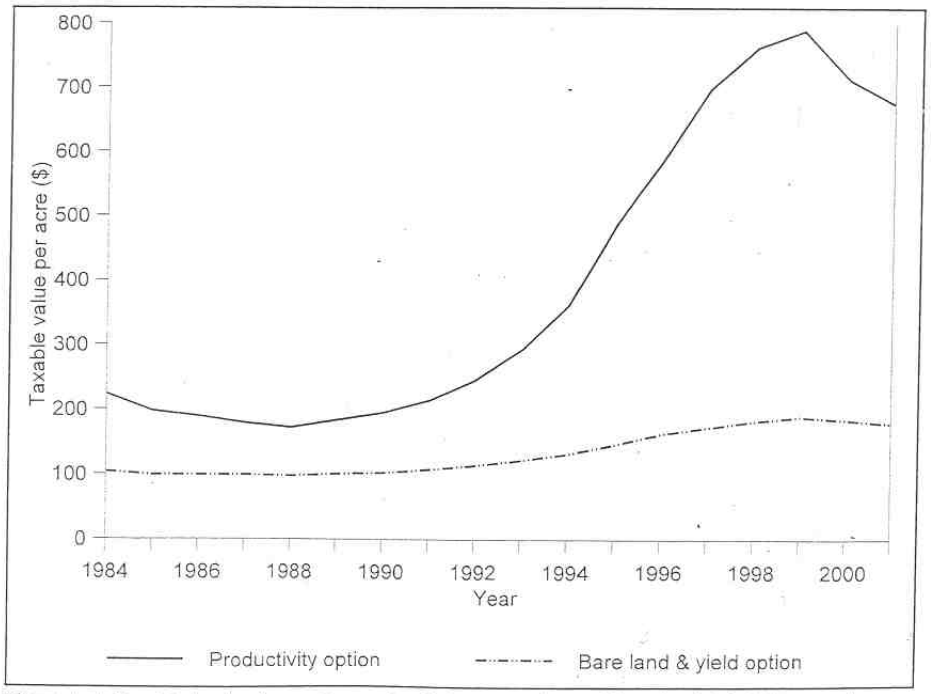

Figure 1-4. Taxable land value under productivity tax option and bare land & yield tax option, Zone 1 - Good productivity class, 1984-2001.

Cook, Philip S., and Jay O'Laughlin. 2001. Taxing Forest Property: Analysis of Alternative Methods and Impacts in Idaho. University of Idaho: Moscow, ID.

Appendix B

Table 1-5. Forest property taxation systems in the United States.						
State	Ad Valorem	Productivity	Site Value	Flat	Exemption	Yield
Alabama		X[2]				X
Alaska					X	
Arizona	X[5]					X
Arkansas		X[2]				X
California			X			X
Colorado		X[3]				
Connecticut		X[1]				X
Delaware					X	
Florida		X[2]				
Georgia		X[1]	X			X
Hawaii						
Idaho		X[3]	X			X
Illinois		X[2]				X
Indiana		X[1]			X	
Iowa					X	
Kansas		X[3]		X		
Kentucky	X					
Louisiana		X[2]				X
Maine		X[1]				
Maryland				X		
Massachusetts	X			X		X
Michigan				X		X
Minnesota	X	X[1]				X
Mississippi		X[2]				X
Missouri				X		X
Montana		X[2]				X
Nebraska		X[3]				

(continued)

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Appendix B

Table 1-5. continued.

State	Ad Valorem	Productivity	Site Value	Flat	Exemption	Yield
Nevada						
New Hampshire	X					X
New Jersey		X[2]				
New Mexico						X
New York					X[4]	X
North Carolina			X			X
North Dakota				X		
Ohio				X	X[4]	
Oklahoma	X					
Oregon		X[1]	X			X
Pennsylvania		X[1]				
Rhode Island						
South Carolina		X[1]				X
South Dakota		X[3]				
Tennessee	X					
Texas		X[2]				
Utah		X[1]				
Vermont				X		
Virginia			X			X
Washington			X			X
West Virginia		X[2]				X
Wisconsin				X		X
Wyoming						

X[1] productivity tax based on gross mean annual revenue.

X[2] productivity tax based on net mean annual revenue.

X[3] productivity tax based on agricultural productivity of the forest land.

X[4] 80% of the assessed value or any assessed value in excess of $40/acre (equalized whichever is less)

X[5] Ad valorem property tax in theory. In practice, the value of the trees is not included in the value of the property for property taxation purposes.

Source: Chang (1996), National Timber Tax Website (2001).

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Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
1. Estate-tax reform.	Private land often sold or modified upon death of owner, destroying quality habitat.	Exempt owner from estate tax if lands managed to conserve habitat until land is sold or developed.	$4 million annually (endangered species only).	Heirs get tax breaks for farmland if they continue farming.	Requires monitoring. May inspire landowners to manage quality habitat. Need to decide if benefit is deferment or forgiveness.	Keystone Center, 1995. OR Dept. of Forestry, 1996. Ferris, 1996.
2. Estate-tax concepts for land conservation.	Conservation needs fall disproportionately on some landowners.	Allow heirs to give land to tax-exempt organizations. Offer tax credits for land gifts.	High — $1 billion plus.			Keystone Center, 1995.
3. Federal tax credits for endangered species management on private land.	Private landowners can't afford to manage endangered species habitat.	Offer tax credits for certain management practices listed or approved by FWS.		Reforestation tax credit, stewardship incentive program.		Keystone Center, 1995. McKinney *et al.* 1994. Ferris, 1996.
4. Property-tax credit for land with endangered species conservation agreement.	Landowners who protect habitat may be charged high taxes for "highest and best use" of the land.	Allow federal tax credit (to offset local property taxes) if land is managed for habitat.	Federal treasury-moderate.			Keystone Center, 1995. McKinney, 1994.
5. Deducting habitat-management costs.	Private, non-industrial landowners must capitalize management costs over years.	Allow landowners to take deductions for habitat management annually.	Low.			Keystone Center, 1995.
6. Land assessment exchanges.	Some federal lands have low habitat value.	Trade, sell or purchase federal, private lands to protect more quality habitat.	Revenue neutral except transaction costs.	Umpqua land exchange.	Willing seller only. Pools funds from sales to purchase private lands.	Keystone Center, 1995. Florida GFWFC, 1994.
7. Endangered species habitat trust fund.	Decreasing acquisition funds and increasing pressure to pay landowners.	Non-profit corporation to complement Interior Land Exchange system.	Neutral.		Goal is to put ecologically significant land in public ownership & maximize return on commercially valuable property.	Keystone Center, 1995.
8. Provide financial incentives for riparian protection.	Riparian lands have high ecological & commercial value.	Use state tax credit to cover management costs.				OR Dept. of Forestry, 1996.
9. Cost-share or tax credits for habitat investments.	Private landowners don't want to bear the cost of protecting public values.	Certify income tax credits for landowners participating in watershed councils.	Could be significant.			OR Dept. of Forestry, 1996. Florida GFWFC, 1994.
10. Conserve priority areas using less than full fee techniques.	Land acquired by the government is removed from tax rolls.	Partnerships, easements, land exchanges.		Land trusts, agencies, private organizations do this.		OR Dept. of Forestry, 1996. Yager, 1994. Ferris, 1996.

Defenders of Wildlife. 1998. *National Stewardship Incentives: Conservation Strategies for U.S. Landowners*. Defenders of Wildlife, Washington, DC.

Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
11. Investment fund to finance stewardship projects.	Technology to reduce pollution can be expensive.	Fund applications through competitive grant applications.	Depends on size of fund.	Grants or low interest loans for no-till drills.	Could be difficult to set guidelines and priorities.	Willamette River Basin Task Force, 1997.
12. Insurance program.	Implementing new techniques creates risk.	Public and/or private resources provide insurance against losses in experimental programs.	Moderate.	Insurance for WA apple growers in biological control study.	Reducing risk may improve willingness to try new techniques.	Willamette River Basin Task Force, 1997.
13. Consolidate funding for federal, state assistance programs.	Funding is hard to find and match with priority projects.	Consolidate programs & channel funds to priority habitat projects.	Could be neutral.		Requires state, perhaps federal legislation .	OR Dept. of Forestry, 1996.
14. Expand CRP to cover broader habitat values CRP does not cover conservation of older trees, for example.	Authorize payments for specific land management practices.	CRP used for erodable land, expanded to address wildlife habitat.			Federal legislation updated 1996.	OR Dept. of Forestry, 1996. Ferris, 1996.
15. Competitive bidding for wildlife habitat.	Now illegal to lease resources and not use them.	Allow leasing public resources for non-use. Permit conservation interests to bid on resources.	Nominal to government.	Private parties bid for extractive uses, why not public uses? Nebraska allows conservation interests to bid on in-stream water for wildlife.	Requires change in Federal law.	Anderson, 1994.
16. Lease in-stream water.	Water rights unused diverted to other users, often wasted.	Individuals, groups purchase water & leave it in streams.	Nominal.	Oregon Water Trust.	Requires change in some state laws. Some states don't allow in-stream use for wildlife.	Anderson, 1994.
17. Create market for development rights and sell on open market.	Habitat given greater economic value in marketplace.	Priority habitats identified and conservation needs defined. Private owners awarded development rights to be bought, sold on open market. Non-critical land assigned marketable development rights.	High administrative.	HCP process uses habitat quotas. Air pollution credits.	Complex bureaucratic structure to administer. Based on notion that certain habitat is "surplus." Controversial.	McKinney *et al.* 1994. Ferris, 1996. Florida GFWFC, 1994.
18. Voluntary land enrollment approach.	Landowners lack financial incentives to protect habitat.	Landowners paid for certain land management 1. Lands identified 2 . Management defined 3 . Compensation identified from a variety of sources.		Resembles conservation reserve and wetland reserve programs.		Bean, 1994.
19. Habitat transaction method for endangered species.	No economic incentive for landowners to conserve habitat.	Land in planning area given conservation value. Credits needed to develop land, and credits gained when land is conserved.	High administrative.	New Jersey Pinelands wetland banking.	Requires precise land, habitat inventory & evaluation. Considers size and shape. Avoids parcel disputes. Legislation required to facilitate, process and address tax issues.	Yager, 1994.

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Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
20. Biodiversity trust fund.	Owners of habitat bear expense while society enjoys benefits. Conflict inevitable.	Public and private funds, privately managed, to purchase conservation easements on lands, pay landowners to use certain management practices, or pay landowners to conserve species habitat.	Could be neutral if investment in subsidies re-directed.	Willing sellers. Competitive conservation planning. Access and severance fees.		Baden, 1994. O'Toole, 1994, 1997. Ferris, 1996.
21. Contracting for conservation.	Private interests may do a better job of recovering species.	Contract habitat or species management to private organizations or companies and pay when recovery targets are met.	Reallocation of money.	Grant management responsibility and exclusive hunting rights to private party.	Some may object to transfer of public assets to private interests.	O'Toole, 1996.
22. In-kind materials.	Landowners may not be able to afford materials for restoration, habitat improvement.	Agencies, organizations provide plants, construction materials.	Low.	Provide tree seedlings or fencing materials.	Landowners or non-profits provide labor.	OR Dept. of Forestry, 1996.
23. Reduce timber excise tax.	Managing for environmental values costs landowners.	Reduce excise tax for owners who adopt desired management practices.	To general fund.		Could also raise tax for landowners who do not adopt desired practices.	K. Johnson, 1995.
24. Reduce forest capital gains tax	Forest land investments and long rotations not encouraged by existing system.	Reduce forest capital gains tax or index or discount for inflation.			Policy decision re: eligibility for small vs. large landowners.	K. Johnson, 1995. Ferris, 1996.
25. Promote value-added forest products economy.	Biodiversity goals and economic goals not closely linked.	Various cooperatives, research assistance to landowners.		Wood Net, Woodcraft Network, WA DNR. Small sales & specialty timber program.		K. Johnson, 1995.
26. Biodiversity pathway.	Some management for biodiversity is inconsistent with management for timber.	Contracts with landowners in priority watersheds issued on a competitive basis.	Goal is highest benefit, lowest cost.		Landowners need assurance that timber could be harvested eventually.	K. Johnson, 1995.
27. Conservation reserve program for endangered species.	Landowners lack incentives for managing habitat.	Farmers paid to manage habitat under contracts.	High.	Greater prairie chicken and sharp-tailed grouse helped by CRP.	Modify existing CRP to include more habitats and management techniques.	Keystone Center, 1995.
28. Green certification.	Landowners using best management practices may not derive economic benefits.	Certify products raised according to best management practices to increase market value.	To producers.	SmartWood, salmon-safe food.	Economists believe green certification adds value to wood products.	OR Dept. of Forestry, 1996. Pacific Rivers Council, 1997.
29. Provide tax benefits for mandated set-asides.	Land can be taken out of production under ESA, but the landowner pays the cost.	Allow landowners to calculate reduced timber value when land set-aside.			May require change in federal tax law.	OR Dept. of Forestry, 1996.

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Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
30. Increase timber liquidity to increase rotation.	Difficult to turn standing timber into cash. Promotes early harvest.	i. Timber futures market ii. Revolving loan fund iii. Create standard process for timber appraisal.	Some public funds needed.	Chicago Board of Trade to open futures market for recyclable materials.		K. Johnson, 1995.
31. Voluntary tax deferred account created from portion of gross timber harvest receipts to care for land in the future.	Multi-generational/long-term nature of forest investment needs addressed.	Account stays with the land with funds only available for approved stewardship purposes.	Likely high depending on how modified.	Norway Forest Trust system.	Interest from these accounts provides educational/technical assistance to woodland owners.	OR Dept. of Forestry, 1996.

Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
1. Habitat conservation plans.	Landowners want more certainty.	HCP approval linked to incidental take permits (ESA).	High.	Weyerhaeuser. State of Oregon.	Controversial. Concern about need for changes in the future.	Peterson, 1997.
2. Streamline HCP process HCP process burdensome, expensive.	Establish "low effects" HCP process — short form.	Might reduce admin. Costs.	Amend NEPA, ESA to avoid duplication.		Consider cumulative effects.	Keystone Center, 1995. Graham, 1994.
3. Seed money for community-based HCPs.	Local government bears expense of HCP process.	Congress funds local, cooperative efforts to develop HCPs through revolving loan fund, matching grants.	$25 million one-time appropriation.	1992-1994 Congress funded Brevard County in Florida.		Keystone Center, 1995. Florida GFWFC, 1994.
4. "No Surprises Policy".	Current HCP process does not provide enough certainty for landowners.	Amend ESA to protect landowners from increasing obligations after HCP approved.		1994 Deptartment of the Interior policy.	Concern about changing conditions and fixed agreements.	Keystone Center, 1995.
5. Cooperative Conservation Planning.	HCP process too complex for many landowner and habitat needs.	Use with rural landowners in agricultural areas. Pool resources. Use "habitat credits." Needs technical assistance.			Requires amendment to ESA if focused on endangered species habitat.	McKinney, 1994.
6. Broader scale habitat recovery planning.	Existing, single endangered species approach too narrow.	Focus planning on larger areas, multiple species before they get into trouble.		Coastal sage scrub.	May require amendments to ESA and FACA.	Opdycke, 1994.
7. Issue interim incidental take permits.	HCP process takes a long time.	Issue temporary incidental take permits while regional plans are developed.	Admininistrative.		Requires amendment to the ESA.	Bartel, 1994.
8. Improve cooperative efforts to restore habitat.	Lack of coordination limits effectiveness of existing programs.	Coordinate federal, local, state, watershed and landowner habitat efforts.				OR Dept. of Forestry, 1996.

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Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
9. Improve and standardize inventory and monitoring.	It is difficult to get information about the status and health of ecosystems.	Coordinate agency programs and involve private landowners.		Coordinated resource-management planning.		OR Dept. of Forestry, 1996.
10. Recovery plan incentives.	ESA does not invite landowner involvement in recovery planning, and sometimes surprises them.	Involve private owners in recovery planning and allocates responsibilities among different parties.			Modify ESA. Need interagency approach. Could help identify priority habitat for acquisition.	Keystone Center, 1995.
11. Address anti-trust concerns.	Concerns about anti-trust limits cooperation among private landowners.	Provide info to landowners and change the law, if necessary.	Administrative.		Amend state law requiring agencies to coordinate activities.	OR Dept. of Forestry, 1996.
12. Common procedures for inventory.	Inconsistent information inhibits coordinated management.	State, federal coordination.	Will save money.	Cooperative monitoring evaluation research committee in Washington.	Federal, state statutes may be necessary.	K. Johnson, 1995.
13. Co-location of public infrastructure corridors.	Unnecessary habitat loss.	Comprehensive planning.	Will save money and habitat.		Should avoid sensitive areas.	Florida GFWFC, 1994.
14. Long term management and use agreements.	Lack of ability for landowners to plan for the future.	Coordinated permit review, incentives, density bonuses.		HCPs.	Purpose to establish commitments of landowners and government to conservation.	Florida GFWFC, 1994.
15. Mitigation agreements.	Existing mitigation too rigid. Narrow, limited ecological benefits.	Focus on ecosystems, accept reclamation as mitigation, establish fund for off-site mitigation purchases of priority areas.	To developers no change.		Expand traditional concept.	Florida GFWFC, 1994.
16. Develop stewardship incentives programs for all sectors.	Only available in forest sector. Underfunded.	Agencies work with landowners, provide technical assistance.	Staff, program admininstration.	Forest stewardship incentive programs.	Existing programs under-funded.	Florida GFWFC, 1994.

Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
1. Pre-listing conservation agreement.	Landowners see endangered species as liabilities.	Voluntary actions to conserve species in return for regulatory relief for landowners.	Administrative.		Landowner protection should carry over if species is listed later.	Keystone Center, 1995.
2. Safe harbors.	Landowners see endangered species as liabilities.	Landowners protect unoccupied endangered species habitats in return for permission to modify habitat in the future.	Limited.	1995 NC Sandhills HCP.	Habitat may be temporary. Notification required before habitat modified.	Keystone Center, 1995. Florida GFWFC, 1994.

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Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
3. "No take" cooperative agreements.	Landowners with endangered species habitat fear prosecution under taking provision.	Landowners protect habitat under management plans developed with FWS in return for management certainty.	Administrative.		Some binding agreements may be necessary to ensure compliance.	Keystone Center, 1995.
4. Guidance to landowners at the time of listing.	Landowners unclear what constitutes taking of endangered species.	Federal register notice contains info concerning specific activities and impact on "taking." Also list of disincentives and recommendations for eliminating them.	Administrative.		Would help landowners plan and manage lands and focus on eliminating disincentives.	Keystone Center, 1995.
5. Increased regulatory flexibility.	No incentive for landowner to downlist, delist endangered species.	Permit management flexibility for threatened species.	Administrative.		Congress makes clearer distinction between threatened and endangered species.	Keystone Center, 1995.
6. Streamline regulatory process for wetland projects.	Two layers of bureaucracy for wetland projects inhibit activity.	Give fish and wildlife agency authority to issue fill and removal permits for habitat projects.	Could save money.			OR Dept. of Forestry, 1996.
7. Simplify regulations for certified good managers.	Many regulations are complex and expensive relative to conservation benefits.			Stewardship agreements.		OR Dept. of Forestry, 1996.
8. Limit liability for habitat-improvement work.	Leaving snags, stream improvements can cause hazards and expose landowners to liability.	Seek statutory limits for liability for certain habitat improvements.	Nominal.	Snags are often removed for safety reasons. Prescribed burning difficult.		OR Dept. of Forestry, 1996. Florida GFWFC, 1994.
9. Tradable credits for endangered species habitats.	Landowner incentives to protect endangered species habitat don't exist.	Take authorized with 2:1 mitigation requirement dropped to 1:1 when goals met. Landowners can trade or sell rights.	High admininistrative.	Red-cockaded woodpecker colonies in NC .	Will require intensive survey and monitoring-authority now exists.	Bean, 1994. Schaerer, 1996.
10. ESA Section 7 blind trust fund.	Delays in endangered species consultations cost landowners money.	Establish "blind" trust fund with private money to pay for timely consultations.	None to government.		Changes in ESA & regs may be required.	Yager, 1994.
11. Issue long-term management permits.	Landowners need certainty.		Administrative.	HCP.	Permits 10-15 years in return for exemption from new regs.	K. Johnson, 1995.
12. Different permits for sensitive sites.	Permit requirements too stringent for sites of lesser value, too lax for important areas.	General permits, exemptions, less restrictive permits for low-priority sites.	Administrative		Purpose is to focus regulatory effort on high priority areas.	Florida GFWFC, 1994.

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Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
13. Eliminate regulatory disincentives for voluntary exotic removal and habitat enhancement.	Regulatory barriers discourage habitat improvements.	Expedited permit or waiver process.	Low.	Landowners need permits to enhance wetlands, build ponds.		Florida GFWFC, 1994.
14. Integrate habitat management plans into reg. review.	Landowners see contradictory, duplicative requirements.	Federal, state, local regs should be included.	High coordination costs.		Should encourage adoption of habitat plans.	Florida GFWFC, 1994.
15. Encourage landowners to do no-penalty env. surveys and audits.	Landowners fear penalties will result if problems are found.	State could offer assistance.	Audit costs.		Should encourage voluntary actions.	Florida GFWFC, 1994.
16. Green planning.	Prescriptive regulations do not always generate best results.	Economic sectors establish goals and are exempt from regulations as long as they are met.	Should be cost effective.	Netherlands, New Zealand.	Oregon exploring options.	H. Johnson, 1995.

Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
1. Create budget squad to kill subsidies. Use money for biodiversity debt reduction.	Federal subsidies encourage habitat destruction.	Budget squad has authority to impound funds from federal programs that harm species.	Redirect $200 million each year.		Would reduce threats, fund biodiversity, reduce deficit.	O'Toole, 1997.
2. Tax penalties for habitat conversion.	Insufficient funding available for incentive programs. Economic costs associated with habitat destruction not paid by users.	Per-acre tax on significant habitat converted to other uses.	Hundreds to thousands per acre to landowners.	Similar to concept of pollution taxes and fees.	Would require extensive surveys to identify taxable habitat.	McKinney, 1994.
3. Impose fees on damaging activity.	Biodiversity value not reflected in markets.	Identify priority areas. Set fees appropriate to biodiversity value.	Could generate revenue.		Need formula for assigning biodiversity value to land. Works best in large planning area.	Reid, 1994. Ferris, 1996. O'Toole, 1994.
4. Paving tax.	Creating impermeable surfaces harms habitat.	Tax "paving" of private lands. Use funds for conservation.	To developers, industry, homeowners.			O'Toole, 1997.
5. Biodiversity trust fund.	Insufficient funding for conservation programs.	Funding from public and private sources to purchase land, easements, contracts, management, administered by board.	Could be neutral if subsidies redirected.	Private conservation organization.	Funding from extractive uses and recreational user fees.	Schaerer, 1996. O'Toole, 1994.
6. Recreational user fees on public and private land.	If only extractive uses generate revenue, they will remain dominant.	Collect fees for rec. use, and use funds to manage lands.	To users, guides.	Fee hunting on private land.	May limit access for low income users, pilot program in place on federal lands.	Schaerer, 1996. O'Toole, 1996.
7. Real estate transfer fee.	No money for incentive programs.	Federal real estate transfer fee.	0.1% could raise $300 million annually.		Requires legislation.	Goldstein, 1994. Ferris, 1996. O'Toole, 1997.

Defenders of Wildlife. 1998. *National Stewardship Incentives: Conservation Strategies for U.S. Landowners*. Defenders of Wildlife, Washington, DC.

Incentives	Problem Addressed	Mechanics	Cost	Examples	Comments	Reference
1. One-stop shopping for technical assistance.	It is difficult and time consuming for landowners to seek advice from many agencies.	Establish multi-agency tech teams to help landowners take a holistic approach.	Could be neutral.		Complicated to fix the problem.	OR Dept. of Forestry, 1996.
2. Stewardship planning.	Landowners may not realize habitat value of their property or know how to manage it.	Direct contact with landowners in priority areas-assistance with conservation planning.	Labor intensive.			OR Dept. of Forestry, 1996.
3. Technical assistance.	The Endangered Species Act seen as punitive. Technical assistance more local, positive.	Information, dollars, materials and other assistance to landowners. Includes agency coordination. Voluntary toll-free number. Help capitalize on wildlife.	Could be substantial.	Prairie chicken viewing opportunities SW Missouri, money for landowners.	Keystone Report says it needs to be flexible, local. Needs to be evaluated. Could also be national or state technical assistance programs.	Keystone Center, 1995. Ferris, 1996.
4. Endangered Species Act Section 6 grants to states for technical assistance.	States lack funding to help landowners.	Grants to states for monitoring, education, technical assistance in priority areas.	Moderate.			McKinney, 1994.
5. Assist landowners with ecosystem approach.	Single species approach does not prevent future problems with other species.	Technical assistance with habitat approach.	Moderate.	Partners for wildlife. USFWS.		Florida GFWFC, 1994.
6. Create commodity commission.	Small landowners need help with scientific, economic, technical challenges.	Assessment on timber harvest funds landowner-assistance programs to implement sustainable forestry.	None to the taxpayer.	Oregon Forest Resources Institute.	Could be matched with public funds with certain expenses.	K. Johnson, 1995.

Defenders of Wildlife. 1998. *National Stewardship Incentives: Conservation Strategies for U.S. Landowners*. Defenders of Wildlife, Washington, DC.

Appendix D

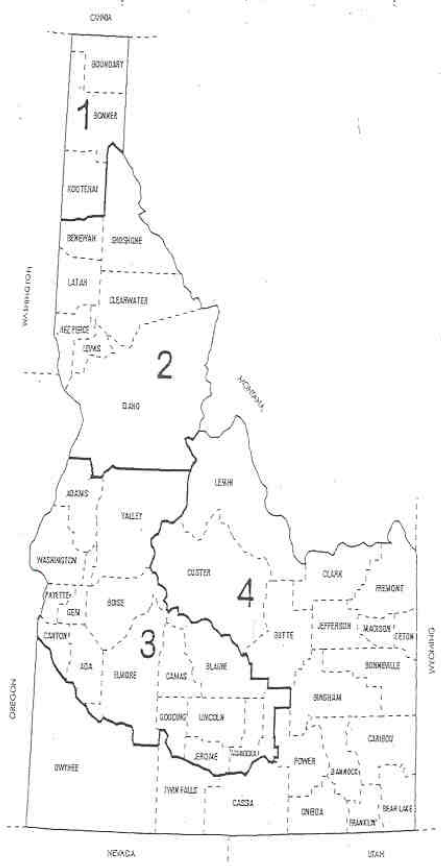
2005 Forestland Value and Stumpage Value Zones in Idaho

Zone 1 Land Grade			
Good	Med.	Poor	
$146	$102	$60	Bare Land & Yield
$496	$276	$127	Productivity

Zone 2 Land Grade			
Good	Med.	Poor	
$143	$90	$46	Bare Land & Yield
$485	$270	$125	Productivity

Zone 3 Land Grade			
Good	Med.	Poor	
$104	$66	$35	Bare Land & Yield
$256	$144	$68	Productivity

Zone 4 Land Grade			
Good	Med.	Poor	
$77	$48	$26	Bare Land & Yield
$255	$149	$77	Productivity



Productivity Class	Avg. Board Ft. Per Acre	
	Zones 1 & 2	Zones 3 & 4
Poor	125	125
Medium	225	213
Good	350	320

Idaho State Tax Commission. 2005. Forest Land Taxation Law 2005. [online]. Idaho State Tax Commission: Boise, ID [cited July 2005]. Available from World Wide Web: (http://tax.idaho.gov/propertytax/PTpdfs/BR_forestlandtaxlaw05portrait.pdf).

Appendix E

Table 5
Policy tools used to encourage compliance with timber harvesting practices, number of states and provinces

Policy tool	North			South			West			Total		
	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers
Cost-share payments	15	1	3	7	0	0	6	0	0	28	1	3
Technical assistance	21	16	16	13	11	13	13	9	11	47	36	39
Grants	8	2	5	1	0	1	0	0	0	9	2	7
Loans	1	0	0	0	0	0	1	0	0	2	0	0
Education programs	21	24	24	13	12	13	12	11	10	46	47	46
Premium prices for products	3	2	5	0	1	1	0	0	0	3	3	6
Preferential access to contracts	2	2	4	0	1	5	0	0	0	2	3	9

Responding states and provinces: *North:* Delaware, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Dakota, Ohio, Rhode Island, South Dakota, Vermont, West Virginia, Wisconsin, Manitoba, Nova Scotia, Prince Edward Island, Quebec, Saskatchewan. *South:* Alabama, Arkansas, Georgia, Florida, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia. *West:* Alaska, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Northwest Territories. Respondents could indicate more than one policy tool.

Table 6
Perceived effectiveness of policy tools to encourage timber harvesting practices

	North			South			West			Total		
	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers
Cost-Share payments	3.35	3.00	2.60	2.50	3.00	NA	2.60	NA	NA	3.00	3.00	2.60
Technical assistance	3.19	2.88	3.00	3.08	3.25	3.08	3.30	3.25	2.67	3.18	3.08	2.95
Grants	2.75	3.50	3.00	3.00	3.00	2.00	2.00	NA	NA	2.70	3.33	2.86
Loans	1.00	NA	1.00	NA	NA	NA	1.00	NA	NA	1.00	NA	1.00
Education programs	2.71	3.18	2.82	2.92	3.08	3.08	3.20	3.33	3.00	2.89	3.19	2.93
Premium prices for products	2.67	4	3.25	2.00	3.00	3.50	NA	NA	NA	2.50	3.33	3.33
Preferential access to contracts	3.00	3	3.20	2.00	3.00	3.80	NA	NA	NA	2.50	3.00	3.50

1, Low effectiveness; 4, high effectiveness. Responding states and provinces: *North:* Delaware, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Dakota, Ohio, Rhode Island, South Dakota, Vermont, West Virginia, Wisconsin, Manitoba, Nova Scotia, Prince Edward Island, Quebec, Saskatchewan. *South:* Alabama, Arkansas, Georgia, Florida, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia. *West:* Alaska, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Northwest Territories. Note: Some states and provinces provided responses on effectiveness, even though they do not currently use the policy tool on the target audience.

Table 7
Perceived policy tool efficiency in incenting use of timber harvesting practices

	North			South			West			Total		
	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers	Landowners	Foresters	Loggers
Cost-share payments	3.12	3.00	3.25	2.67	NA	NA	3.00	NA	NA	3.00	3.00	3.25
Technical assistance	3.30	2.88	3.06	3.42	3.27	3.17	3.40	3.38	3.25	3.36	3.11	3.13
Grants	3.00	2.67	2.25	2.00	NA	NA	NA	NA	NA	2.83	2.67	2.25
Loans	1.00	NA	NA	NA	NA	NA	2.00	NA	NA	1.50	NA	NA
Education programs	3.00	3.19	3.19	3.17	3.55	3.17	3.36	3.36	3.36	3.14	3.33	3.23
Premium prices for products	2.67	1.50	3.40	NA	3.50	3.50	NA	NA	NA	2.67	2.50	3.43
Preferential access to contracts	NA	2.00	3.20	NA	3.00	3.60	NA	NA	NA	NA	2.67	3.40

1, Investment greatly exceeds benefits; 4, benefits greatly exceed investment. Responding states and provinces: *North:* Delaware, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Dakota, Ohio, Rhode Island, South Dakota, Vermont, West Virginia, Wisconsin, Manitoba, Nova Scotia, Prince Edward Island, Quebec, Saskatchewan. *South:* Alabama, Arkansas, Georgia, Florida, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia. *West:* Alaska, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Northwest Territories. Note: Some states and provinces provided responses on efficiency, even though they do not currently use the policy tool on the target audience.

Kilgore, Michael A., Charles R. Blinn. 2004. Policy Tools to Encourage the Application of Sustainable Timber Harvesting Practices in the United States and Canada. *Forest Policy and Economics*. 6: 111-127.

Appendix F

Table 1
Summary of coordinated programs

	Timber harvest/ protected areas[a]	Recreation public access	Magnitude of incentive[b]	Duration of commitment	Penalty
Alternative 0 (status quo)	All avail., none protect. $1200/year revenues $0/year loss	None	Assessed full $3000/year tax $0/year gain	N/A	N/A
Alternative 1	1/3 avail., 2/3 protect. $400/year revenues $800/year loss	Limited	Assessed 1/3 $1000/year tax, $2000/year gain	20 years	Back taxes, interest 6-year max.
Alternative 2	2/3 avail., 1/3 protect. $800/year revenues $400/year loss	Limited	Assessed 2/3 $2000/year tax, $1000/year gain	10 years	Back taxes, interest 3-year max.
Alternative 3	1/3 avail., 2/3 protect. $400/year revenues $800/year loss	None	Assessed full $3000/year tax $0/year gain	10 years	Back taxes, interest 3-year max.
Alternative 4	All avail., none protect. $1,200/year revenues $0/year loss	None	Assessed 1/3 $1000/year tax, $2000/year gain	10 years	Back taxes, interest 6-year max.
Alternative 5	2/3 avail., 1/3 protect. $800/year revenues $400/year loss	None	Assessed full $3000/year tax $0/year gain	20 years	Back taxes, interest 6-year max.
Alternative 6	All avail., none protect. $1,200/year revenues $0/year loss	None	Assessed full $3000/year tax $0/year gain	10 years	Back taxes, interest 3-year max.
Alternative 7	All avail., none protect. $1,200/year revenues $0/year loss	Limited	Assessed full $3000/year tax $0/year gain	10 years	Back taxes, interest 6-year max.
Alternative 8	All avail., none protect. $1,200/year revenues $0/year loss	Limited	Assessed 2/3 $2000/year tax, $1000/year gain	20 years	Back taxes, interest 6-year max.
Alternative 9	All avail., none protect. $1,200/year revenues $0/year loss	Limited	Assessed full $3000/year tax $0/year gain	20 years	Back taxes, interest 3-year max.
Alternative 10	1/3 avail., 2/3 protect. $400/year revenues $800/year loss	Limited	Assessed full $3000/year tax $0/year gain	20 years	Back taxes, interest 3-year max.
Alternative 11	All avail., none protect. $1,200/year revenues $0/year loss	None	Assessed full $3000/year tax $0/year gain	20 years	Back taxes, interest 6-year max.
Alternative 12	2/3 avail., 1/3 protect. $800/year revenues $400/year loss	Limited	Assessed full $3000/year tax $0/year gain	10 years	Back taxes, interest 6-year max.
Alternative 13	All avail., none protect. $1,200/year revenues $0/year loss	None	Assessed 2/3 $2000/year tax, $1000/year gain	20 years	Back taxes, interest 3-year max.
Alternative 14	All avail., none protect. $1,200/year revenues $0/year loss	Limited	Assessed 1/3 $1000/year tax, $2000/year gain	10 years	Back taxes, interest 3-year max.
Alternative 15	1/3 avail., 2/3 protect. $400/year revenues $800/year loss	None	Assessed 2/3 $2000/year tax, $1000/year gain	10 years	Back taxes, interest 6-year max.
Alternative 16	2/3 avail., 1/3 protect. $800/year revenues $400/year loss	None	Assessed 1/3 $1000/year tax, $2000/year gain	20 years	Back taxes, interest 3-year max.

[a] Loss refers to potential timber reserve foregone as compared with the status-quo.
[b] Gain refers to tax savings as compared with the status-quo.

Klosowski, R., T. Stevens, D. Kittredge, D. Dennis. 2001. Economic Incentives for Coordinated Management of Forest Land: a Case Study of Southern New England. *Forest Policy and Economics*. 2: 29-38.

Appendix G

$$k_2 = (Q - h_1) + F(Q - h_1) - h_2, \tag{2b}$$

$$\bar{c}_2 = \bar{p}_2^* h_2 - T + (1 + r)[p_1^* h_1 - T - c_1]. \tag{2c}$$

The first-order conditions are

$$EU_{c_1} = A\exp(-Ac_1) - \beta RA\exp(-x) = 0, \tag{3}$$

$$EU_{h_1} = \beta AR p_1^* \exp(-x) - m[1 + \beta(1 + F')] = 0, \tag{4}$$

$$EU_{h_2} = \beta A[\bar{p}_2^* - A(1 - \tau)^2 h_2 \sigma_p^2]\exp(-x) - \beta m = 0. \tag{5}$$

Utilizing $EU_{h_2} = 0$ in EU_{h_1} leads to the cutting rule given in Equation (7′) of the text.

The second-order conditions in Equation (6) hold due to the assumption regarding the concavity of the utility function and the forest growth function. These are

$$EU_{c_1c_1} = -A^2\exp(-Ac_1) - \beta A^2 R^2 \exp(-x) < 0, \tag{6a}$$

$$EU_{h_1h_1} = -\beta(AR p_1^*)^2 \exp(-x) + m\beta F'' < 0, \tag{6b}$$

$$EU_{h_2h_2} = \beta A^2[\bar{p}_2^* - A(1-\tau)^2 h_2 \sigma_p^2]^2 \exp(-x) - \beta A^2 (1-\tau)^2 \sigma_p^2 \exp(-x) < 0. \tag{6c}$$

$$\Delta = \begin{vmatrix} EU_{c_1c_1} & EU_{c_1h_1} & EU_{c_1h_2} \\ EU_{h_1c_1} & EU_{h_1h_1} & EU_{h_1h_2} \\ EU_{h_2c_1} & EU_{h_2h_1} & EU_{h_2h_2} \end{vmatrix} < 0, \tag{6d}$$

where the cross-derivatives are

$$EU_{c_1h_1} = \beta A^2 R^2 p_1^* \exp(-x) > 0,$$

$$EU_{c_1h_2} = \beta A^2 R p_1^* (\bar{p}_2^* - A(1-\tau)^2 h_2 \sigma_p^2)\exp(-x) > 0,$$

$$EU_{h_1h_2} = -\beta A^2 R p_1^* (\bar{p}_2^* - A(1-\tau)^2 h_2 \sigma_p^2)\exp(-x) < 0.$$

To find how current and future harvesting change as the site productivity tax T, yield tax τ and timber price risk σ_p^2 changes we use Cramer's rule. First of all, we have

$$\begin{bmatrix} EU_{c_1c_1} & EU_{c_1h_1} & EU_{c_1h_2} \\ EU_{h_1c_1} & EU_{h_1h_1} & EU_{h_1h_2} \\ EU_{h_2c_1} & EU_{h_2h_1} & EU_{h_2h_2} \end{bmatrix} \begin{bmatrix} \mathrm{d}c_1 \\ \mathrm{d}h_1 \\ \mathrm{d}h_2 \end{bmatrix} = - \begin{bmatrix} EU_{c_1T} & EU_{c_1\tau} & EU_{c_1\sigma_p^2} \\ EU_{h_1T} & EU_{h_1\tau} & EU_{h_1\sigma_p^2} \\ EU_{h_2T} & EU_{h_2\tau} & EU_{h_2\sigma_p^2} \end{bmatrix} \begin{bmatrix} \mathrm{d}T \\ \mathrm{d}\tau \\ \mathrm{d}\sigma_p^2 \end{bmatrix}, \tag{7}$$

where the determinant Δ of the LHS matrix of Equation (7) is negative by the second-order conditions.

Solving Equation (7) for h_1 and h_2 in terms of $\mathrm{d}T$ gives

$$h_{1T} = -\beta R p_1^* A^2 (1-\tau)^2 \sigma_p^2 \Phi > 0, \text{ where}$$

$$\Phi = \Delta^{-1}\{\beta^2 A^4 (1 + R)\exp(-2x - Ac_1)\} < 0, \tag{8}$$

$$h_{2T} = mF''[\bar{p}_2^* - A(1-\tau)^2 h_2 \sigma_p^2]\Phi > 0. \tag{9}$$

A change in the variance of the timber price leads to

$$EU_{c_1\sigma_p^2} = EU^c_{c_1\sigma_p^2} - (1/2)(1-\tau)^2 h_2^2 (1 + R)^{-1} EU_{c_1T}, \tag{10a}$$

Koskela, Erkki, and Markku Ollikainen. 1997. Optimal design of Forest Taxation with Multiple-Use Characteristics of Forest Stands. *Environmental and Resource Economics*. 10: 41-62.

Appendix G

$$EU_{h_1\sigma_p^2} = EU^c_{h_1\sigma_p^2} - (1/2)(1-\tau)^2 h_2^2 (1+R)^{-1} EU_{h_1 T}, \tag{10b}$$

$$EU_{h_2\sigma_p^2} = EU^c_{h_2\sigma_p^2} - (1/2)(1-\tau)^2 h_2^2 (1+R)^{-1} EU_{h_2 T}, \tag{10c}$$

where $EU^c_{c_i\sigma_p^2}$ and $EU^c_{h_i\sigma_p^2}$, i=1,2 refer to the substitution effects. Solving Equation (7) for h_1 and h_2 in terms of the substitution effects of σ_p^2 yields

$$\begin{aligned} h^c_{1\sigma_p^2} &= -\Delta^{-1}\{\beta^2 A^6 (1-\tau)\sigma_p^2 h_2 R p_1^* [\bar{p}_2^* - A(1-\tau)^2 h_2 \sigma_p^2] \exp(-2x - Ac_1)\} > 0 \quad (11)\\ h^c_{2\sigma_p^2} &= \Delta^{-1}\{\beta^2 A^6 (1-\tau)\sigma_p^2 h_2 (R p_1^*)^2 \exp(-2x - Ac_1) - \\ &\quad EU_{c_1 c_1}\beta^2 A^2 (1-\tau)^2 h_2 m F'' \exp(-x)\} < 0. \quad (12)\end{aligned}$$

The total effect of a change in the variance on harvesting is thus given by the Slutsky equation

$$h_{i\sigma_p^2} = h^c_{i\sigma_p^2} - \frac{1}{2}(1-\tau)^2 h_2^2 (1+R)^{-1} h_{iT}, \quad \text{for } i = 1,2. \tag{13}$$

As for the effects of the yield tax note first that

$$EU_{c_i\tau} = EU^c_{c_i\tau} - (1+R)^{-1} z EU_{c_i T}, \tag{14a}$$

$$EU_{h_1\tau} = EU^c_{h_1\tau} - (1+R)^{-1} z EU_{h_1 T}, \tag{14b}$$

$$EU_{h_2\tau} = EU^c_{h_2\tau} - (1+R)^{-1} z EU_{h_2 T}, \tag{14c}$$

where $z = [\bar{p}_2 - A(1-\tau)^2 h_2 \sigma_p^2] h_2 + R p_1 h_1$, and $EU^c_{c_i\tau}$ and $EU^c_{h_i\tau}$, $i = 1,2$ refer to the substitution effects.

Solving Equation (7) for h_1 and h_2 in terms of the substitution effects of τ and utilizing Equations (11) and (12) gives

$$\begin{aligned} h^c_{1\tau} &= h^s_{1\tau} - (1-\tau)^{-1}\sigma_p^2 h^c_{1\sigma_p^2} < 0, \quad (15)\\ h^c_{2\tau} &= h^s_{2\tau} - (1-\tau)^{-1}\sigma_p^2 h^c_{2\sigma_p^2} = ?, \quad (16)\end{aligned}$$

where h^s_i, $i = 1,2$ denote for the 'conventional' substitution effects defined as follows

$$\begin{aligned} h^s_{1\tau} &= (1-\tau)^{-1}[p_1 h^c_{1p_1} + \bar{p}_2 h^c_{1\bar{p}_2}] = -\Delta^{-1}[\beta A^3 R p_1^* (1-\tau)\sigma_p^2 EU_{c_1 c_1}\exp(-2x)] < 0,\\ h^s_{2\tau} &= -(1-\tau)^{-1}[p_1 h^c_{sp_1} + \bar{p}_2 h^c_{s\bar{p}_2}] = \Delta^{-1}[\beta A m F''(\bar{p}_2^* - \\ &\quad A(1-\tau)h_2\sigma_p^2) EU_{c_1 c_1}\exp(-x)] < 0.\end{aligned}$$

The total effect of a change in the yield tax can be obtained by utilizing the Slutsky decomposition and Equations (14) and (15), and it is

$$h_i = h^c_{i\tau} + (1+R)^{-1} z h_{iT}, \quad \text{for } i = 1,2. \tag{17}$$

Koskela, Erkki, and Markku Ollikainen. 1997. "Optimal design of Forest Taxation with Multiple-Use Characteristics of Forest Stands." *Environmental and Resource Economics*. 10: 41-62.

Appendix G

Appendix 1. Comparative Statics of Timber Supply

This appendix derives the comparative statics of timber supply reported in the text both under timber price risk and under certainty. The expected utility maximization problem is reproduced here for convenience.

(A) THE CASE OF UNCERTAINTY

$$\underset{c_1,h_1,h_2}{MAX}\ EU = -\exp(-Ac_1) - \beta\exp(-x) + m(k_1 + \beta k_2), \tag{1}$$

where $x = A\bar{c}_2 - \frac{1}{2}A^2(1-\tau)^2h_2^2\sigma_p^2$, subject to

$$k_1 = Q - h_1, \tag{2a}$$

Appendix 2: The sign of $(B_1h_{1\tau}^c + B_2h_{2\tau}^c)$ as $\tau \to 0$

This appendix fixes the sign of $B_1h_{1\tau}^c + B_2h_{2\tau}^c)$ in Equation (23) of the text as $\tau \to 0$. Recalling that $B_1 = m(1+\beta(1+F'))$ and $B_2 = \beta m$, we have to determine the sign of

$$\phi = [1+\beta(1+F')]h_{1\tau}^c + \beta h_{2\tau}^c. \tag{1}$$

Using the expressions of $h_{1\tau}^c$ and $h_{2\tau}^c$ and arranging the terms gives the following expression.

$$\phi = -\sigma_p^2\{[1+\beta(1+F')]h_{1\sigma_p^2}^c + \beta h_{2\sigma_p^2}^c\} + [1+\beta(1+F')]h_{1\tau}^0 + \beta h_{2\tau}^0. \tag{2}$$

The substitution effects $(h_{1\tau}^0, h_{2\tau}^0)$ are negative at $\tau = 0$. As for the first RHS term, notice first that $EU_{h_2} = 0$ is equivalent to $(\bar{p}_2 - Ah_2\sigma_p^2) = m(\exp(-x))^{-1}$ as $\tau = 0$. Utilizing Equations (11) and (12) from Appendix 1 and substituting $m(\exp(-x))^{-1}$ for $(\bar{p}_2 - Ah_2\sigma_p^2)$ yields

$$\begin{aligned} &-\sigma_p^2\Delta^{-1}\{\beta^2A^6h_2Rp_1[\beta Rp_1\exp(x) - (1+\beta(1+F'))m]\exp(-x)^{-1}\}, \\ &-\sigma_p^2\Delta\{\beta^2A^2h_2mF''EU_{c_1c_1}\exp(-x)\}. \end{aligned} \tag{3}$$

The first term in Equation (3) is zero by $EU_{h_1} = 0$. Hence what is left from ϕ is

$$\phi = [1+\beta(1+F')]h_{1\tau}^0 + \beta h_{2\tau}^0 - \sigma_p^2\Delta^{-1}\{\beta^2A^2h_2mF''EU_{c_1c_1}\exp(-x)\}. \tag{4}$$

This is equal to $\phi = [1+\beta(1+F')]h_{1\tau}^0 + \beta\Delta^{-1}\{\beta^2Ah_2mF''(\bar{p}_2 - 2Ah_2\sigma_p^2)\exp(-x)\}$, which is clearly negative so that $B_1h_{1\tau}^c + B_2h_{2\tau}^c < 0$ as $\tau \to 0$.

Koskela, Erkki, and Markku Ollikainen. 1997. Optimal design of Forest Taxation with Multiple-Use Characteristics of Forest Stands. *Environmental and Resource Economics*. 10: 41-62.

Appendix H

Figure 1: Projected Acres of Certified Forest Land

with varying levels of subsidy, on plots of land from 20 to 499 acres

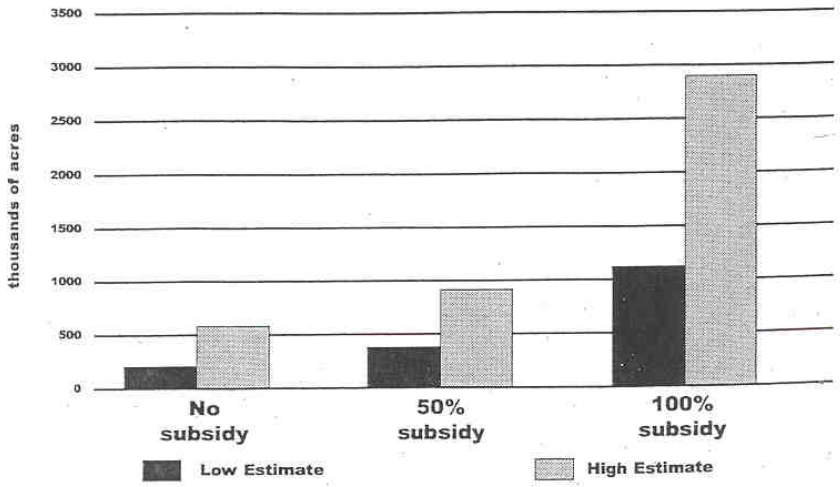
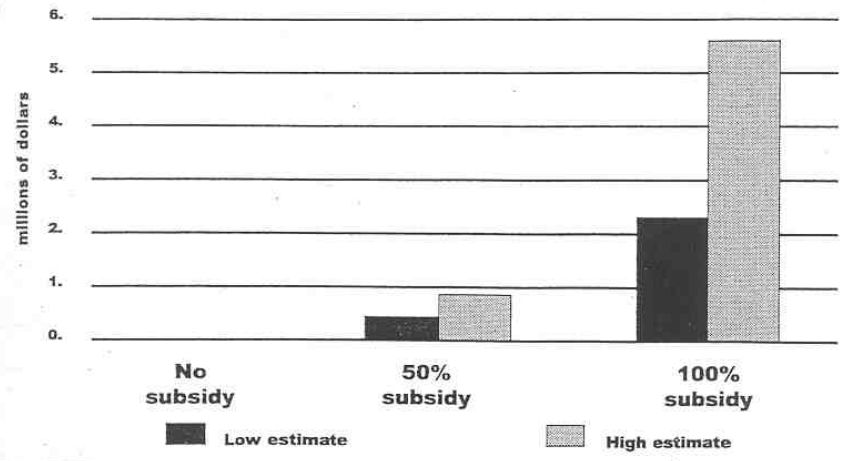


Figure 2: Total Annual Cost of a Certification Subsidy

by varying levels of subsidy, on plots from 20 to 499 acres



Teisl, Mario F., Andrew J. Plantinga, Thomas G. Allen, David Field. 2001. Funding Forest Certification. *Choices: Ideas for Shared Prosperity*. Vol. 7, No. 4: 1-8

Appendix H

Table 1. Estimated severance tax as a percentage of the total value of wood harvested commercially from woodlots at least 20 acres in size.

Proposed level of subsidy:	Low Estimate	High Estimate
No Subsidy	-%	-%
50% Subsidy	0.2%	0.4%
100% Subsidy	1.2%	2.9%

Table 3. Net tax shift resulting from a severance tax on all commercial harvests on woodlots of at least 20 acres in size, and a certification subsidy to owners with 20-499 acres by size, holdings and level of subsidy.

	50% Subsidy	100% Subsidy
Low Estimate		
Size Class		
1-9 acres	$ 0	$ 0
10-19 acres	$ 0	$ 0
20-49 acres	$ 186,802	$ 233,630
50-99 acres	$ 24,765	$ 485,171
100-199 acres	$ 45,891	$ 607,453
200-499 acres	$ 12,582	$ 234,979
500-999 acres	$ (13,860)	$ (80,131)
1,000-4,999 acres	$ (16,334)	$ (94,435)
5,000+ acres	$ (239,847)	$ (1,386,667)
High Estimate		
Size Class		
1-9 acres	$ 0	$ 0
10-19 acres	$ 0	$ 0
20-49 acres	$ 368,088	$ 748,669
50-99 acres	$ 78,110	$ 1,221,163
100-199 acres	$ 133,377	$ 1,454,582
200-499 acres	$ 38,744	$ 669,028
500-999 acres	$ (31,735)	$ (210,098)
1,000-4,999 acres	$ (37,401)	$ (247,602)
5,000+ acres	$ (549,183)	$ (3,635,743)

Table 2. Estimated severance tax per unit of wood harvested commercially from woodlots at least 20 acres in size.

	Low Estimate 50% Subsidy	Low Estimate 100% Subsidy	High Estimate 50% Subsidy	High Estimate 100% Subsidy
Pulpwood	Dollars per Cord		Dollars per Cord	
Aspen	$ 0.02	$ 0.09	$ 0.04	$ 0.23
Hemlock	$ 0.02	$ 0.13	$ 0.05	$ 0.32
Mixed Hardwood/Softwood	-	-	-	-
Other Hardwood	$ 0.02	$ 0.09	$ 0.04	$ 0.23
Other Softwood	$ 0.03	$ 0.16	$ 0.06	$ 0.41
Red Pine	$ 0.02	$ 0.12	$ 0.04	$ 0.29
Spruce & Fir	$ 0.04	$ 0.22	$ 0.08	$ 0.55
White Pine	$ 0.02	$ 0.10	$ 0.04	$ 0.26
Sawlogs	Dollars per MBF*		Dollars per MBF*	
Ash	$ 0.26	$ 1.49	$ 0.57	$ 3.76
Aspen	$ 0.09	$ 0.50	$ 0.19	$ 1.25
Beech	$ 0.12	$ 0.72	$ 0.27	$ 1.81
Cedar	$ 0.12	$ 0.72	$ 0.27	$ 1.81
Hemlock	$ 0.14	$ 0.79	$ 0.30	$ 1.98
Mixed Hardwood/Softwood	-	-	-	-
Other Hardwood	$ 0.21	$ 1.22	$ 0.47	$ 3.09
Other Softwood	$ 0.12	$ 0.72	$ 0.27	$ 1.81
Red Oak	$ 0.45	$ 2.59	$ 0.99	$ 6.54
Red Pine	$ 0.13	$ 0.74	$ 0.28	$ 1.87
Red/White Maple	$ 0.17	$ 0.98	$ 0.37	$ 2.48
Spruce & Fir	$ 0.26	$ 1.48	$ 0.56	$ 3.73
Sugar Maple	$ 0.31	$ 1.81	$ 0.69	$ 4.58
White Birch	$ 0.22	$ 1.27	$ 0.48	$ 3.21
White Oak	$ 0.30	$ 1.72	$ 0.66	$ 4.35
White Pine	$ 0.28	$ 1.59	$ 0.61	$ 4.03
Yellow Birch	$ 0.24	$ 1.37	$ 0.52	$ 3.47
Biomass	Dollars per Ton		Dollars per Ton	
All Species	$ 0.00	$ 0.01	$ 0.00	$ 0.03

* MBF denotes a thousand board feet; divide by 2 to estimate tax per cord of sawlogs.

Teisl, Mario F., Andrew J. Plantinga, Thomas G. Allen, David Field. 2001. Funding Forest Certification. *Choices: Ideas for Shared Prosperity*. Vol. 7, No. 4: 1-8

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Table 8.1—Comparison of Federal income tax incentives by timber type

Incentives	Timber type: Loblolly pine	Bottomland hardwood	Upland hardwood
		Dollars	
A. Current law			
Present value of Federal income tax receipts	11,202	8,669	4,774
Present value of cash flow to the owners	48,410	28,079	18,873
B. Further reduced tax rates for long-term capital gains			
Present value of Federal income tax receipts	6,502	4,953	2,382
Difference from current law	-4,699	-3,716	-2,392
Present value of cash flow to the owners	53,110	31,795	21,265
Difference from current law	4,699	3,716	2,392
C. Income averaging			
Present value of Federal income tax receipts	9,267	7,687	3,836
Difference from current law	-1,935	-982	-938
Present value of cash flow to the owners	50,557	29,214	19,911
Difference from current law	2,147	1,135	1,039
D. Enhanced reforestation amortization provisions			
Present value of Federal income tax receipts	10,077	7,180	4,736
Difference from current law	-1,125	-1,490	-38
Present value of cash flow to the owners	49,943	30,202	18,926
Difference from current law	1,533	2,123	53
E. Immediate deduction of reforestation expenses			
Present value of Federal income tax receipts	10,838	8,074	5,016
Difference from current law	-363	-595	242
Present value of cash flow to the owners	49,340	29,380	18,848
Difference from current law	930	1,301	-24
F. Green account			
Present value of Federal income tax receipts	9,881	7,151	4,774
Difference from current law	-1,321	-1,518	0
Present value of cash flow to the owners	50,181	30,196	18,873
Difference from current law	1,771	2,117	0
G. Stewardship investment provisions			
Present value of Federal income tax receipts	10,052	7,560	3,756
Difference from current law	-1,150	-1,109	-1,018
Present value of cash flow to the owners	48,410	28,079	18,873
Difference from current law	0	0	0

Source: Sections A through F—Greene 1998; section G—Greene and Beauvais (2002).

Wear, David N., Greis, John G. 2002. The Southern Forest Resource Assessment. USDA For. Serv. Gen. Tech. Rep. SRS-53. 635 p.

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Table 8.4—State and year use-value law enacted

Key forestry provisions	AL 78	AR 81	FL 59	GA 91	KY 70	LA 76	MS 80	NC 73	OK 74	SC 75	TN 76	TX 79	VA 71
Type of statute													
1. Pure preferential assessment		X	X			X	X		X				
2. Deferred taxation	X				X			X		X	X	X	X
3. Restrictive agreements				X									
Scope of statute													
1. Mandatory		X					X		X				
2. Optional	X		X	X	X	X		X		X	X	X	X
Restrictions on eligibility													
1. None, i.e., all forest land eligible	X	X							X				
2. Minimum acreage				X	X	X	X	X			X		X
3. History of forest use				X								X	
4. Under approval/sound program of management								X			X		
5. Minimum annual gross forest income						X							
6. Areas classified/zoned as forest land			X										X
7. Timber available for harvesting												X	X
8. Market value exceeds use value								X					
9. Highest and best use is timber growing													
10. Other				X				X		X		X	X
Application requirements													
1. None		X							X				
2. Initial application	X			X	X			X		X	X	X	X
3. Annual applications or recommitments			X				X						
4. Enter contractual agreement													
5. Other				X		X							
Determination of current use value													
1. Definition only													
2. Relevant factors listed					X								
3. Agriculturally based valuation									X		X		
4. Income capitalization	X	X	X	X		X	X	X	X	X	X	X	X
a. Schedule provided	X			X			X	X		X	X	X	X
b. Timber exemption	X			X		X	X	X			X		
c. Bare land value approach								X					X
d. Sustained yield approach	X	X	X	X		X	X		X	X	X	X	
5. Other				X						X			
Declassification penalty													
1. None		X	X			X	X		X				
2. Rollback tax	X			X	X					X	X		
3. Rollback tax with interest								X				X	X

Wear, David N., Greis, John G. 2002. The Southern Forest Resource Assessment. USDA For. Serv. Gen. Tech. Rep. SRS-53. 635 p.

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Example 1. *Calculation of the total volume of the annual taxable increment of a woodlot*

Site tax class	Area (A), ha in each site tax class	Average increment (I), scum/ha in each site tax class	Total increment in each site tax class, scum (A x I)
I	3,0	6,4	19,2
II	5,0	4,6	23,0
III	6,0	3,2	19,2
IV	1,0	1,9	1,9
TOTAL VOLUME OF THE ANNUAL TAXABLE INCREMENT, scum			**63,3**

Example 2. *Calculation of the gross unit value for the annual taxable increment in a municipality*

Stumpage prices (P), by assortment FIM/scum			Structure of the growing stock (S = 1/100)*	Returns, FIM/scum (P x S)
Logs	Pine	250,00	25	62,50
	Spruce	180,00	14	25,20
	Birch	255,00	5	12,80
Pulpwood	Pine	82,00	25	20,50
	Spruce	93,00	11	10,20
	Birch	91,00	13	11,80
GROSS UNIT VALUE OF THE ANNUAL TAXABLE INCREMENT, FIM/scum:				**143,00**

Example 3: *Definition of the influence of the cutting savings in a municipality*

Total annual increment of cordwood, scum	250 000 **(A)**
- commercial roundwood production, scum	198 000
= volume of cutting savings, scum	52 000
Half of the cutting savings is taken into account, i.e. scum:	26 000 **(B)**

The proportional share of the cutting savings out of the total annual increment of the cordwood is defined according to the formula applied, i.e. **B/A** = 26 000/250 000 = 0.104. The impact of the cutting savings on the gross unit value of the annual increment can be then calculated by deducting this share from the original gross unit value, in this case (see Example 2): **143,00 FIM/scum** x (1 - 0,104) = **128,13 FIM/scum**

Example 4: Definition of the net unit value of the annual increment

Monetary unit value after substracting the impact of cutting savings (see Example 3), FIM/scum	128,13		
+ influence of forest insurance compensation, FIM/scum	0,20		
Total, FIM/scum	128,33		
- influence of average deductions (in this case 10 per cent): (= 0.90 x 128,33)	115,50	=	Net unit value for the current year
Average of two years' net unit values: [115,50 + 110,50 (net example value of the previous year)]/2,	**113,00**	=	**Final unit value for taxation**

Ylitalo, Esa. 1998. Forest Taxation in Finland—a review of the systems currently in use. Finnish Forest Research Institute: Helsinki.

Example 5: Definition of the annual assessed average yield for a woodlot

Total volume of annual taxable increment of a woodlot(see Example 1):	63,3	scum
Final net unit value for taxation (see Example 4):	113,00	FIM/scum
Annual assessed average yield:	**113,00 FIM/scum * 63,3 scum = 7 153 FIM**	

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APPENDIX 1. MAIN FEATURES OF THE FOREST INCOME TAXATION SYSTEMS APPLIED IN FINLAND

FOREST TAXATION ACCORDING TO ACTUAL STUMPAGE REVENUES	AREA-BASED FOREST TAXATION SYSTEM
* adopted in 1993	* adopted as early as 1922
* based on real stumpage revenues and real expenses	* based on the assessed average yield determined by - forest land area - average increment of the growing stock - annual unit value of the increment
* capital income, taxed by fixed capital income per cent	* earned income which, summed together with all the other earned income of a forest owner, is taxed according to the progressive income taxation scale
	* forest income = annual value of the total assessed increment
* has to be paid only when timber has been sold	* has to be paid annually regardless of whether timber has been sold or not
* neutral	* instrument of forest policy for increasing the supply of roundwood and for encouraging investments in timber production including grants and tax reliefs
* simple	* parameters used for assessing the annual yield are based on average data from large forest areas
	* very much administrative work, grown into an overcomplicated and expert-oriented system

Ylitalo, Esa. 1998. Forest Taxation in Finland—a review of the systems currently in use. Finnish Forest Research Institute: Helsinki.

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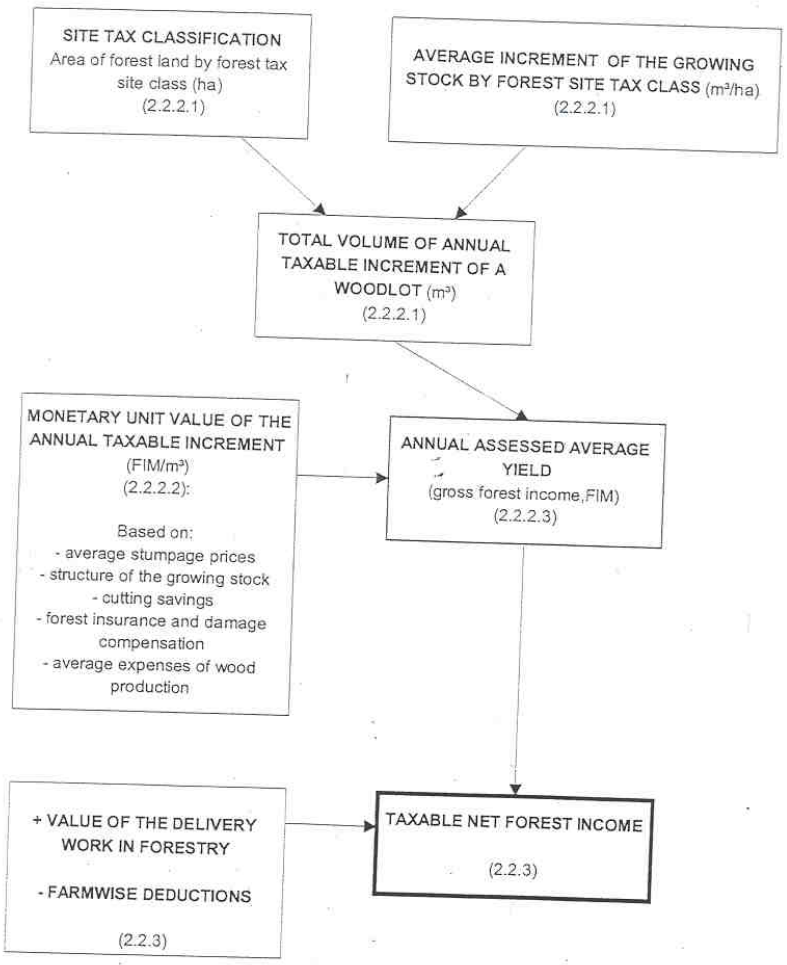
APPENDIX 2. A MODEL FOR AREA-BASED FOREST TAXATION SYSTEM

(Numbers in boxes refer to corresponding sections in text)



Ylitalo, Esa. 1998. Forest Taxation in Finland—a review of the systems currently in use. Finnish Forest Research Institute: Helsinki.